MICROTHERM

Temperature sensor
PT series

Type

- PT100
- PT500
- PT1000

Applications

- Motors
- Electric drives
- E-mobility plug
- Medical technology
- Building technology
- Predictive maintenance

Benefits

- High accuracy and reliability
- Long-term stability
- Wide temperature range
- Small dimensions and weight
- Short response time

Description

The PT-series temperature sensors describe a family of sensors that use a positive temperature coefficient with nearly linear characteristic. It is a precise and high performance choice suitable for use in measurement equipments and control systems. The PT-series contains various options in resistances: PT100, PT500 and PT1000 whereas the figure refers to the given resistance value at 0°C. Our PT-sensors are based on thin film technology chips which allow the completed sensor unit to be designed in smallest shapes. Standard designs are sealed by potting and consequently the mechanical stability is high and the sensor provides short response times. Beside the regular tolerance class B, advanced classes are available. Further to the standard types we offer a wide range of executions for specific customer applications.

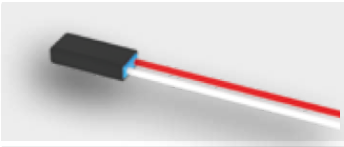
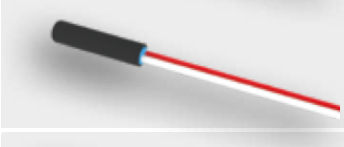
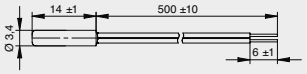
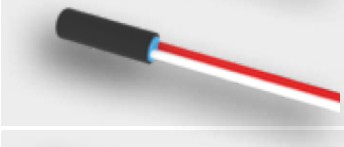
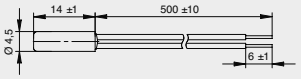
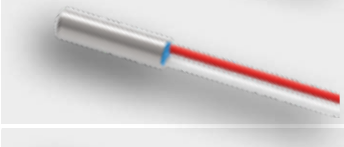
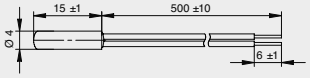
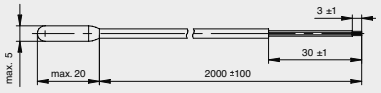



Technical data

description	characteristics		
type	PT100	PT500	PT1000
typical resistance at 0°C	100 Ω	500 Ω	1000 Ω
operating temperature range	-40°C ... 175°C		
insulation resistance (100V DC / 20°C)	≥ 100 MΩ		
dielectric strength (standard insulation)	2 kV		
measuring current	0.3 to 1.0 mA	0.1 to 0.7 mA	0.1 to 0.3 mA

Platinum resistance temperature detector (PRTD) according to DIN EN 60751, standard execution class B, TK = 3850ppm/K; measuring current: self-heating has to be considered

Standard types

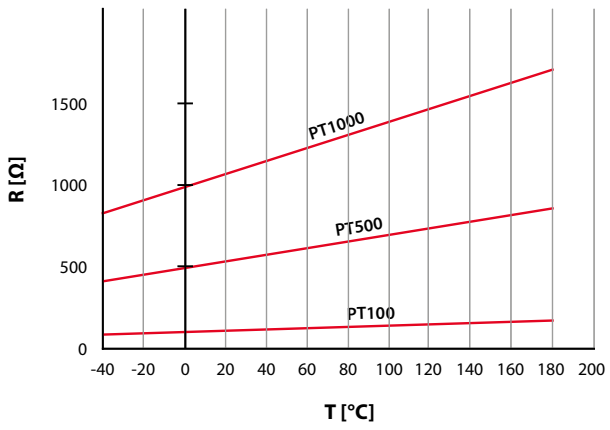
type	code	illustration	drawing dimensions (mm)	technical description
PT100 PT500 PT1000	G919			housing PPS, potted, AWG24
PT100 PT500 PT1000	G920			housing PPS, potted, AWG24 / AWG26
PT100 PT500 PT1000	G921			housing PPS, potted, AWG20 / AWG24
PT100 PT500 PT1000	G922			housing stainless steel (ø3 on request), potted, AWG24
PT100	U450			-30°C to 125°C, resin, cable 2-wire / 3-wire (sheath: XLPE grey, single leads: teflon), dielec. strength 750VAC

Other options on request: Tolerance class A / lead wire AWG / lead length / lead color / high temperature PT max. 250°C

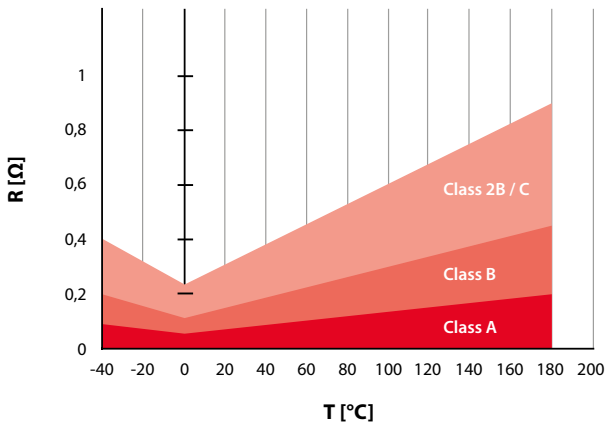
Temperature vs. resistance

T °C	-40	-20	0	20	40	60	80	100	120	140	160	180
PT100	84,27	92,16	100	107,79	115,54	123,24	130,90	138,51	146,07	153,58	161,05	168,48
tol. ±Ω	0,20	0,16	0,12	0,16	0,19	0,23	0,27	0,30	0,34	0,37	0,41	0,44
PT500	421,35	460,80	500	538,97	577,70	616,21	654,48	692,53	730,34	767,92	805,27	842,39
tol. ±Ω	0,99	0,79	0,59	0,78	0,97	1,15	1,34	1,52	1,70	1,87	2,05	2,22
PT1000	842,71	921,60	1000	1077,94	1155,41	1232,42	1308,97	1385,06	1460,68	1535,84	1610,54	1684,78
tol. ±Ω	1,98	1,57	1,17	1,55	1,93	2,30	2,67	3,03	3,39	3,75	4,10	4,44

Characteristics curve



Resistance error



Tolerance class

tolerance class designation		limiting deviation
tolerance acc. to DIN EN 60751 2009-05	tolerance acc. to DIN EN 60751 1996-07	| t | = absolute value of temperature in °C without consideration of the sign
F 0.15	Class A	± (0.15 + 0.002 | t |)
F 0.30	Class B	± (0.3 + 0.005 | t |)
F 0.60	Class 2B / C	± (0.6 + 0.01 | t |)

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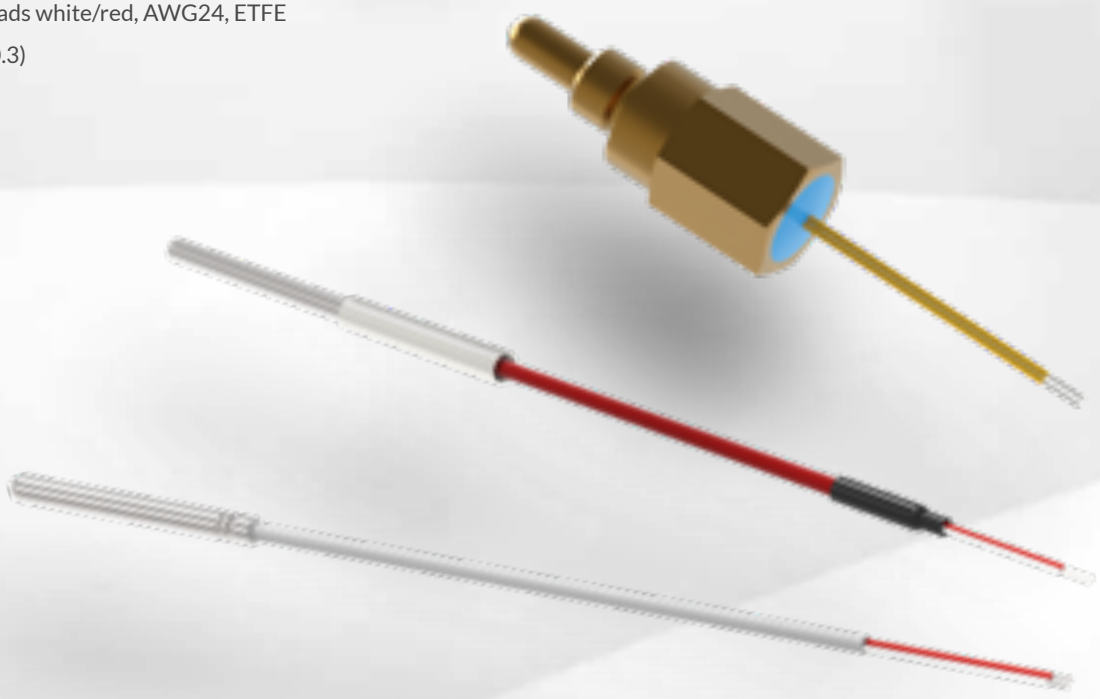
Standard types

lead (stranded)	code	temp. max.	operating voltage	approx. Ø insulation	approx. cross section	material	UL-Style
white	L390	200°C	600V	1.0 mm	**AWG26** / 0.14 mm²	ETFE	10086
red	L396						
white	L360			1.2 mm	**AWG24** / 0.24 mm²		
red	L366						
white	L370			1.6 mm	**AWG20** / 0.50 mm²		
red	L376						

Ordering example standard types

PT **1000** **B** **L360/L366** **500** **G919**

- PT — Type of sensor
- 1000 — R (Ω) at 0°C
- B — Class B (F0.3)
- L360/L366 — Leads white/red, AWG24, ETFE
- 500 — Length of leads (±10 mm)
- G919 — Housing number



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01/2020-Technical subject to change without notice

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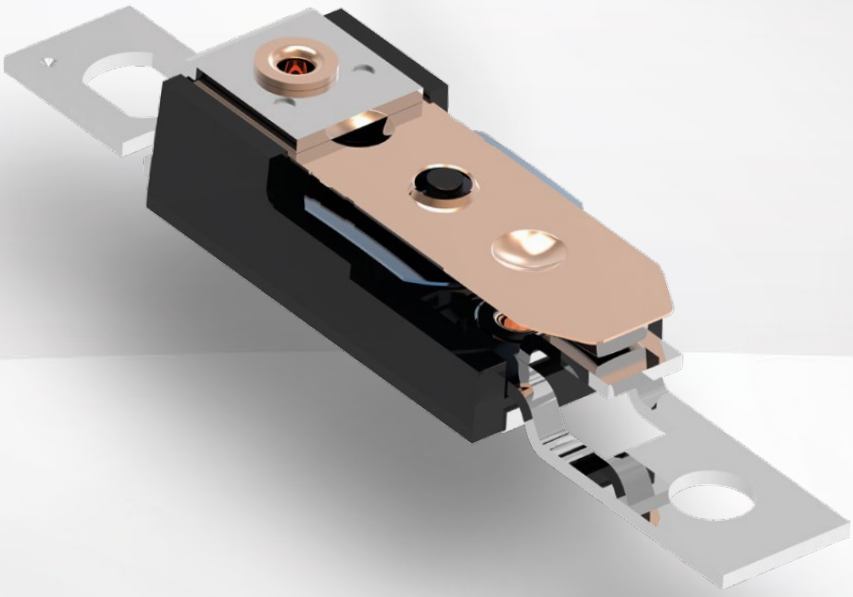
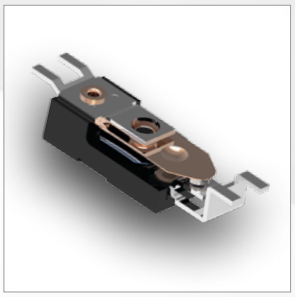
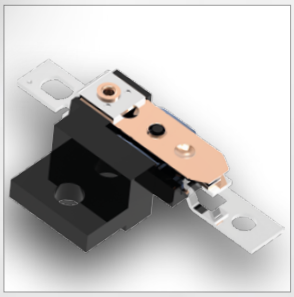
Current and time based switch
Temperature limiter
Thermostat





Applications

- Household appliances
- Electronics
- Fan heaters
- Automotive industry

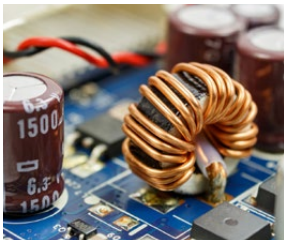
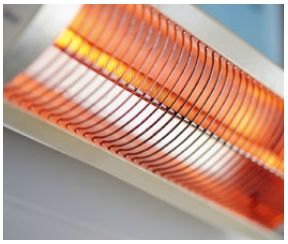
Benefits

- Highest safety by self hold types
- PCB terminals available
- Customized ratings
- Manual reset

Description





Series A switches are based on a **complex system consisting of a contact spring unit and a thermo-bimetal snap-disc**. When heating up to the fixed switching point, the contact opens and thus interrupts the power circuit.

They are very flexible to use: Due to the different types of reset and the adjustable current sensitivity for quick shutdowns, the A switches offer **high quality solutions**, especially in very specific safety concepts.

Temperature switch with **automatic reset A10**: After a certain cooling phase (temp. hysteresis) the contact switches back automatically.

Temperature limiter with **manual reset A20**: After opening the contacts and the subsequent cooling the contacts remain open until a manual reset is performed on the reset pin.

Temperature switch with **electr. self-hold A30 (230V) / A40 (120V)**: After opening the contacts the switch is heated by a parallel connected resistor and thus kept open. The automatic reset is only performed through a mains disconnection, or off-switching of the device in which the temperature switch is installed.

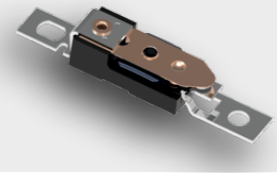
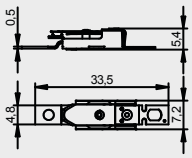
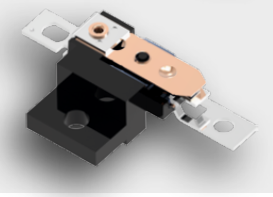
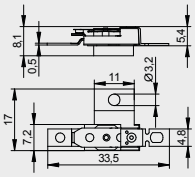
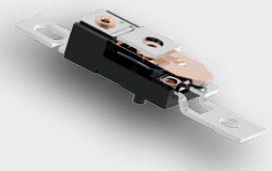
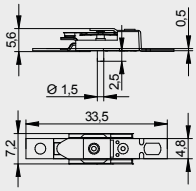
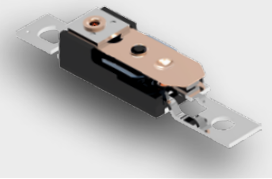
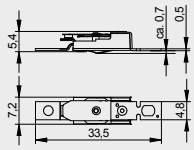
Technical data

type ratings			control			
			A10V A11V	A20V A21V	A30V A31V	A40V A41V
function			automatic	manual	self hold 230 V	self hold 120 V
version			normally closed			
VDE	rated current at 50 / 60 Hz (power factor 0.95 / 0.6)		16 A / 2.5 A (250 V)	16 A / 2.5 A (250 V)	16 A / 2.5 A (230 V)	19.2 A / 2.5 A (120 V)
	switching cycles		10,000	1,000	10,000	8,000
	temperature range T_A (steps in 5 °C)		70 °C ... 160 °C	70 °C ... 130°C / 140 °C	70 °C ... 160 °C	
UL	rated current at 50 / 60 Hz (power factor 1.0 / 0.75)		16 A / 6.3 A (250 V)			16 A / - (125 V)
	switching cycles		6,000			
	temperature range T_A (steps in 5 °C)		70 °C ... 160 °C			
max. current at 250 V 50/60Hz (power factor 0.95)			25 A			
switching cycles under max. current			200			
tolerance			standard: ± 5 °C			
feature of automatic action			1.B, 2.B	2.B	2.C.AK	
contact resistance			< 50 mΩ			
hysteresis / reset temperature [1]			30 °C ± 15 °C / -	- / < -20 °C ; < -10°C	- / < -20 °C [2]	
suitable for use in protection class			I, II			
approvals	VDE / ENEC		EN 60730-1 / -2-9			
	UL		UL 873			
	CSA		C22.2 No. 24 [3]			
	CQC		GB14536.1-1998 / GB14536.10-1996 [4]			

[1] at the T_A (upper and lower) limits the hysteresis could deviate [2] without air flow [3] different power rating [4] details on request

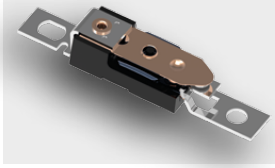
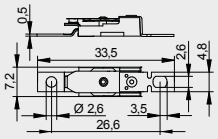
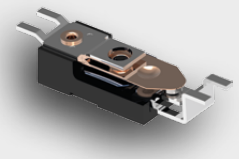
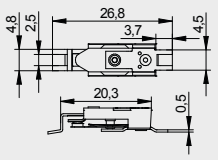
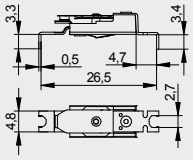
For special applications version P is available with a very low self heating rate.
Manual reset: The maximum operating force must not exceed 6 N. The control should not be reset before the starting conditionsare reached, meaning there should be a satisfactory cooling down time!
Technical data on request.

Versions

TCO		illustration	drawing dimensions (mm)	technical specification	approvals
standard	current - time based [1]				
A10V	A12V			base of thermoset-ting plastic	VDE, UL, CSA
A11V A21V A31V A41V	A13V A23V A33V A43V			screw-on fixing base of thermosetting plastic	VDE, UL, CSA
A20V	A22V			manual reset base of thermosetting plastic possible srew-on fixing dimensions see above	VDE, UL, CSA
A30V A40V	A32V A42V			voltage maintained PTC 120V or 230V base of thermoset-ting plastic possible screw-on fixing dimensions see above	VDE, UL, CSA

[1] For current-time based types (execution D, J, K, L, M, P, R, V) the following information must be provided:

- GDC or AC voltage U_N in Volts.
- Continuous operating current I_C in Amps at which the switch must not respond.
- Current level I_0 in Amps at which the switch must respond and the response time t_0 (in seconds ± tolerance).
- Ambient temperatures which could be experienced both in normal operation and in switching conditions.
- Maximum current in Amps.

code	used in TCO	illustration	drawing dimensions (mm)	technical specification	approvals
standard	A10, A11, A12, A13 A20, A21, A22, A23 A30, A31, A32, A33 A40, A41, A42, A43			terminals for soldering, screwing, riveting or welding-CuNi18Zn20 [1]	VDE, UL, CSA
A321	A10, A12 A20, A22 A30, A32 A40, A42			SMD terminals CuNi18Zn20 [1]	VDE, UL
A322	A10, A12 A20, A22 A30, A32 A40, A42			THT terminals CuNi18Zn20 1) Anschlüsse CuNi18Zn20 [1]	VDE, UL

[1] P types have terminals of CuFe2P material

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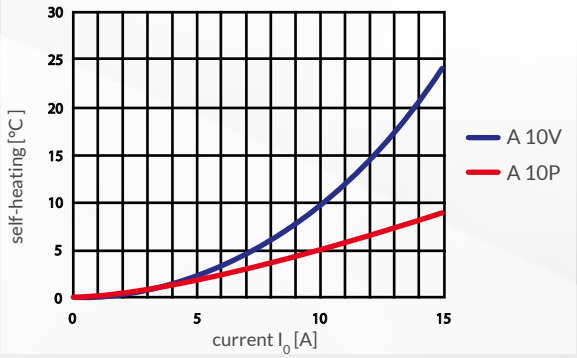
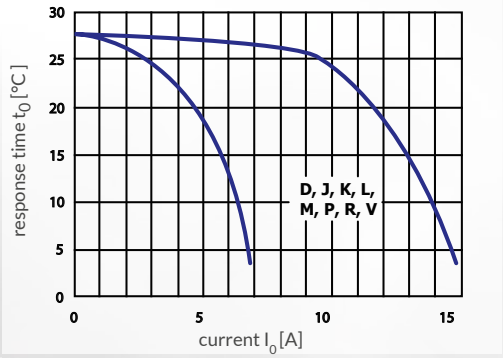
Current vs. self heating



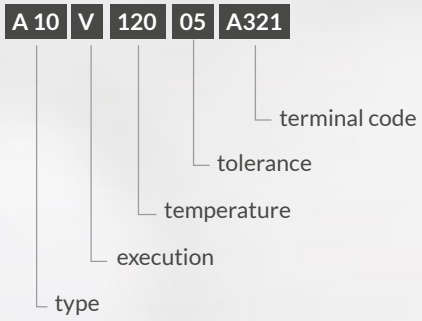
Test conditions:
Measurement in air flow and lead wires of 1.5 mm².

Current vs. response time



TCO variations for current-time based applications.

Ordering example



Marking

A10V	type and execution
D	country (D=Germany)
12005	response temperature (120°C), tolerance (± 5°C)
057	date of manufacture (May 2017)
A12D	type and execution
H	country (H=China)
--123	customized type with drawing number
057	date of manufacture (May 2017)

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05/2017-Technical subject to change without notice

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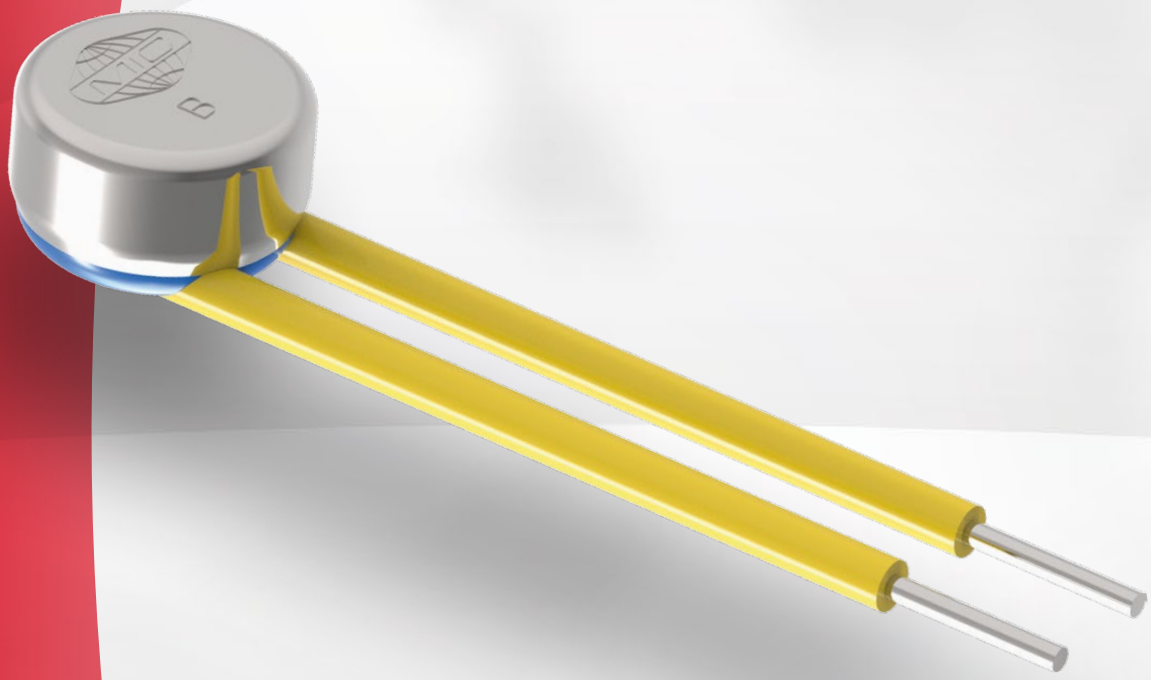
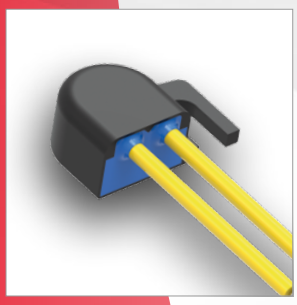
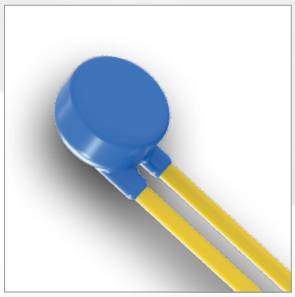
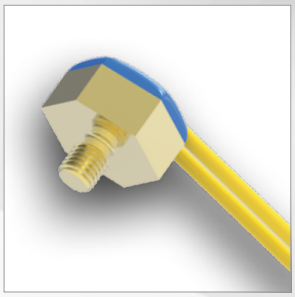
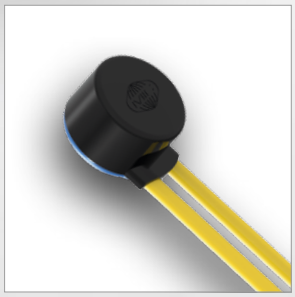
Thermal motor protector
Temperature limiter
Thermal cut-out



Applications

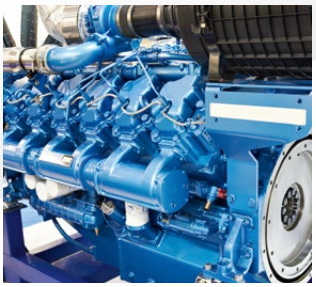
- Motors
- Transformers
- Coils
- Electronics, sensors
- Process automation

Benefits

- Non-sensitive to current
- High current rating up to 30 A
- Manifold executions
- Special low voltage execution

Description






Type **series B** switches have a thermo-bimetallic snap-disc with a fixed switching temperature as the switching element. In the case of an external temperature input, the **double contact system of the switch**, and thus the circuit of the application is opened or closed. The heat transfer is performed from all sides onto the housing of the switch by means of convection, or direct heat conduction.

B12 switches are universally applicable through their design, their **wide range of performance**, and their diverse range of designs: as a protective switch, sensor, controller.

Especially applications in the area of temperature sensors with low voltage and signal currents require **gold plated contacts** which is available in our B13 series.

Beside the standard counters in single implementation the protectors are also offered in **twin and triplet configuration**.

Technical data

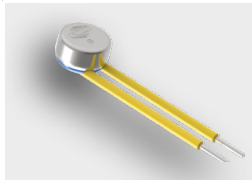
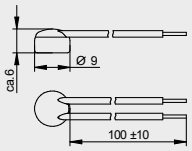
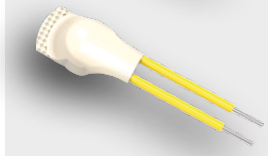
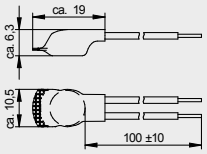
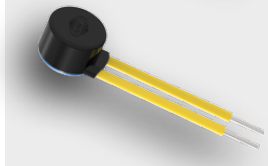
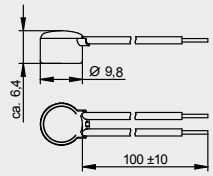
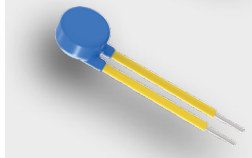
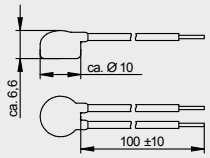
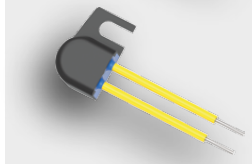
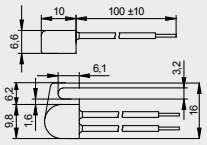
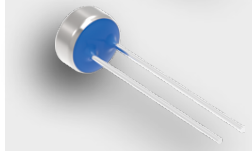
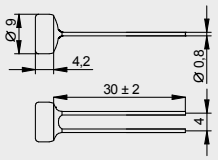
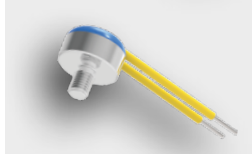
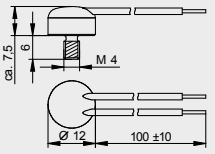
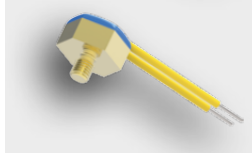
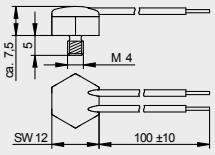
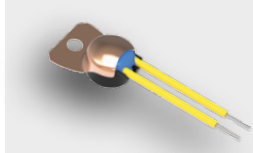
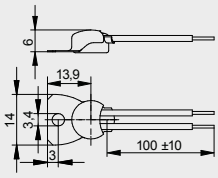
type ratings			control			
			B12A / E		B12B / G	B13N / T
version			normally closed		normally open	normally closed/open
rated current at 250 V 50/60 Hz (power factor 0.95 / 0.6)			10.0 A / 6.0 A	13.0 A / 6.0 A	5.0 A / 1.6 A	1...100 mA (24 Vdc)
switching cycles under rated current			10,000	1,000	5,000	10,000
max. current under failure conditions at 250 V 50/60 Hz (power factor 0.95)			30.0 A			-
switching cycles under max. current			100			-
temperature rating T_A (steps in 5 °C)			70 °C ... 190 °C	70 °C ... 160 °C	70°C ... 185 °C	70 °C ... 160 / 155 °C
tolerances			Standard: ± 5 °C			
feature of automatic action			1.B, 2.B, 1.C		1.B	-
contact resistance (incl. wire of 100 mm)			< 50 mΩ			
hysteresis			30 °C ± 15 °C [1]			
dielectric strength (standard insulation)			2 kV			-
shock / vibration testing (similar to EN 50155)			400 m/s2 sine half wave / 100 m/s2 5 Hz ... 2,000 Hz sine			
resistances to impregnation			tight against ordinary resins and lacquers			
degrees of protection provided by enclosures (EN 60529)			IP00			
suitable for use in protection category			I, II			-
approvals	VDE / ENEC		EN 60730-1 / -2-9			no approval required to voltage ratings lower than 42 V
	UL		UL 2111 / UL 873 [2]			
	CSA / cUL		C22.2 No. 77 / C22.2 No. 24 [2]			
	CQC		GB14536.1-1998 / GB14536.10-1996 [2]			

[1] at the T_A (upper and lower) limits the hysteresis could deviate, for T_A > 130°C the hysteresis is 30°C -15°C/+30°C. [2] on request

The variety of our product variations is nearly infinite. Microtherm distinguishes itself by a high expert's know-how in the area of customised developments. We will be pleased to give you specific advice during a personal consultation and present you all the options suitable for your application:

- application of plug connectors
- unique packaging and overmolding variations
- specific cable assemblies and many more

Varianten

control type	n.c.	n.o.	code	illustration	drawing dimensions (mm)	technical specification	approvals (only for B12)
B12 B13	A N	B T				not insulated potted	VDE, UL, cUL, CSA
B12 B13	A N	B T	U253			shrink cap potted	VDE, UL, cUL
B12 B13	A N	B T	U186			cap of PPS potted	VDE, UL, cUL
B12 B13	A N	B T	U112			coated T_A max. 160°C	VDE, UL, cUL
B12 B13	A N	B T	U294			housing of PPS potted T_A max. 160°C	VDE, UL, cUL
B12 B13	A N	B T	A800			not insulated potted	VDE, UL, cUL
B12 B13	E N	G T	G402			aluminium housing thread M4x6 potted T_A max. 150 °C	VDE, UL, cUL
B12 B13	E N	G T	G714			brass housing thread M4x5 potted T_A max. 150 °C	VDE, UL, cUL
B12 B13	A N	B T	B245			CuBe mounting cap combined with U186 / U112	VDE, UL, cUL

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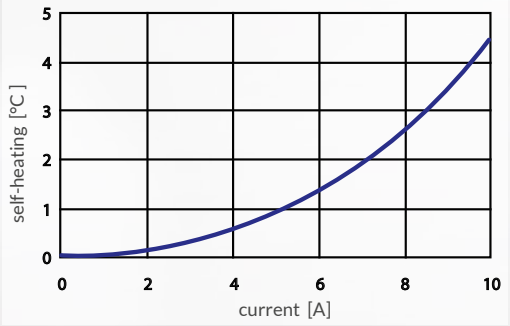
Standard wire

lead	code	temperature max.	operating voltage max.	approx. diameter-insulation	approx. cross section / diameter	UL style
stranded white	L300 [1]	150 °C	300 V	1,50 mm	AWG24 / 0,25 mm²	3398
	L310			1,82 mm	AWG20 / 0,50 mm²	
	L320			2,10 mm	AWG18 / 1,00 mm²	
	L360 [1]	200 °C	600 V	1,20 mm	AWG24 / 0,25 mm²	10086
	L370			1,60 mm	AWG20 / 0,50 mm²	
	L380			1,80 mm	AWG18 / 1,00 mm²	
solid yellow	L410	150 °C	300 V	1,66 mm	AWG20 / 0,80 mm	3398
	L440	200 °C	300 V	1,54 mm	AWG20 / 0,80 mm	1332

Standard length 100 ± 10 mm, stripped 6 ± 1 mm, AWG20 is recommended [1] B13 only

Heating by current



The characteristic curve in the diagram is measured with a thermal switch without any insulation in an oil bath.

Note:

The self-heating depends on the thermal conduction of the control to the equipment or part which should be protected.

Ordering example

B12 A 120 05 L310 300 U253

- U253 — shrink cap insulation
- 300 — length 300 mm
- L310 — lead wire white, AWG20
- 05 — tolerance
- 120 — temperature
- A — normally closed
- B12 — type

Marking

B12A type (B12 n.c.)

12005 response temperature (120°C), tolerance (± 5°C)

056D date of manufacture (May 2016), country (D=Germany)

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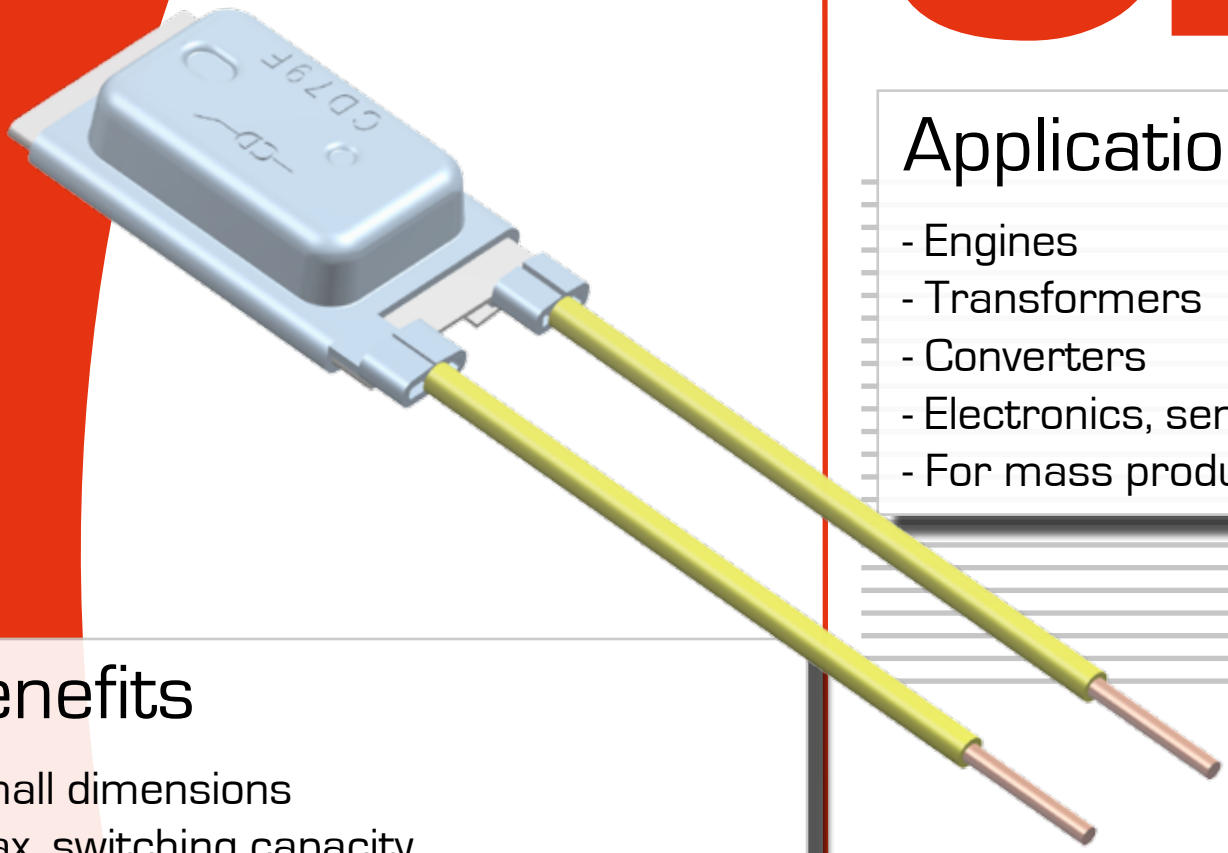
MICROTHERM

CD

Thermal motor protector
Temperature control
Temperature limiter
Thermal protection for ballast

79F



Applications

- Engines
- Transformers
- Converters
- Electronics, sensors
- For mass production

Benefits

- Small dimensions
- Max. switching capacity
- Temperature and current sensitive
- Low contact resistance

MICROTHERM

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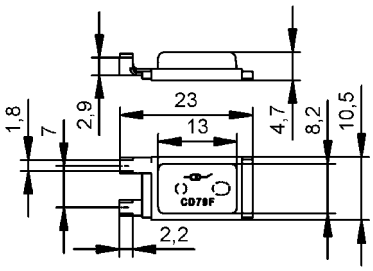
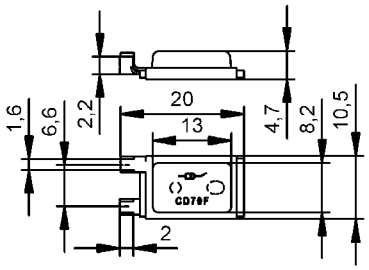
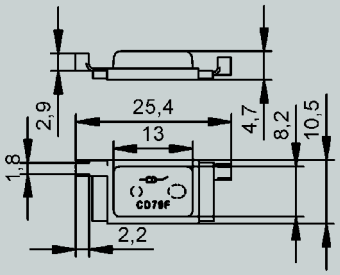
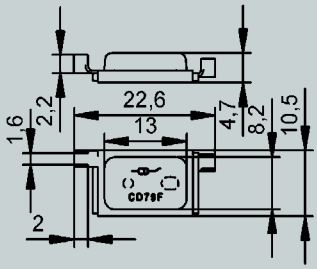
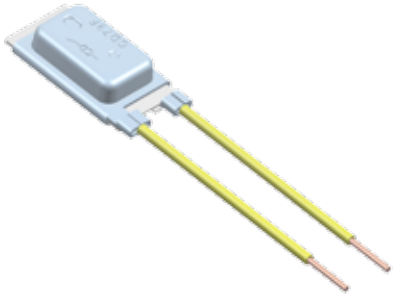
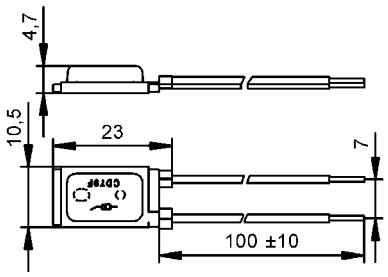
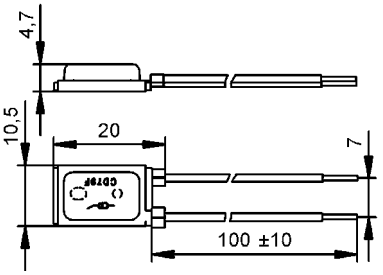
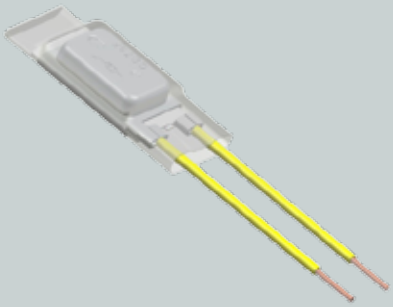
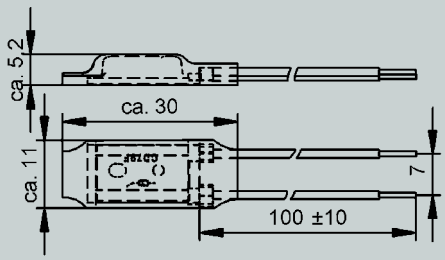
Technical data

type ratings / control type		CD 79 F-series		
		rated current	**switching cycles**	**temperature rating**
VDE	**DIN EN 60730-2-9**	12 V DC 16A	10,000	60°C to 180°C
		120 V AC 16A	10,000	
		240 V AC 9A	10,000	
		250 V AC 2A	100,000	
		250 V AC 5A	35,000	
		250 V AC 3A, cos phi 0,4	10,000	
		250 V AC 10 A	10,000	
	DIN EN 60730-2-2	12 V DC	-	60°C to 180°C
		120 V AC		
		250 V AC		
	DIN EN 60730-2-3	250 V AC 3A	-	60°C to 180°C
UL / cUL	**UL 2111** **UL 873**	16 V DC 20A	10,000	60°C to 180°C
		120 V AC 22A, 60 HZ	10,000	
		120 V AC 5A, 60 HZ	100,000	
version		—o—o— normally closed		
tolerances		±5%, max. 7K		
contact resistance		≤ 50 mΩ		
housing material		nickel steel		
hysteresis		between 5K and 50K under response temperature		
housing insulation		optional		
degree of protection of enclosure (EN 60529)		IP 00		
suitable for use in protection category		I, II		
guidelines and norms		RoHS-conformity, REACH-conformity		

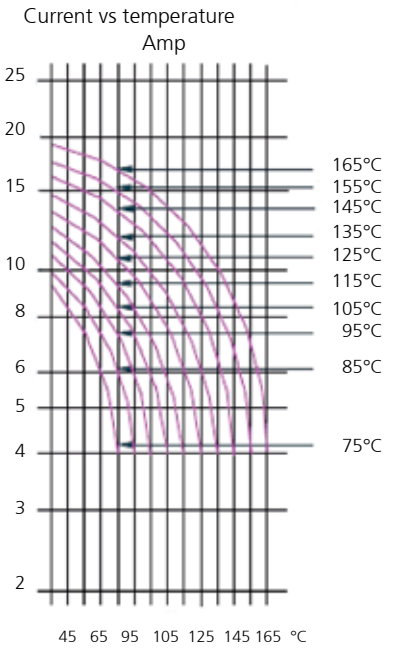
Standard leads

lead	code	temperature max.	operating voltage max.	approx. diameter insulation	approx. cross section diameter	UL style
leads white	L310	150°C	300 V	1,82 mm	AWG 20 / 0,48 mm²	3398
	L370	200°C	600 V	1,60 mm	AWG 20 / 0,48 mm²	10086
leads white	L320	150°C	300 V	2,10 mm	AWG 18 / 0,81 mm²	3398
	L380	200°C	600 V	1,80 mm	AWG 18 / 0,96 mm²	10086

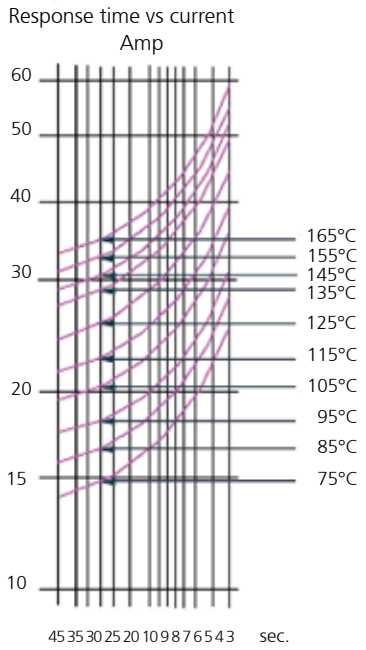
Standard length 100 mm ± 10 mm, stripped insulation 6 ± 1 mm.
Leads or solid wires are available in various lengths, cross-sections and qualities.
The temperature rating of the connecting leads covers the nominal response temperature of the cutout as a minimum.

switch type	illustration	standard VDE / UL dimensions (mm)	standard UL / cUL dimensions (mm)
CD79F A Crimp connection A = connection both one end			
CD 79F B crimp connection B = connection opposite ends			
CD79F A Crimp connection with leads A = connection both one end			
CD79F A Crimp connection with leads and insulation Available with various insulations (for example Nomex-Mylar) A = connection both one end			

Temperature-current-response time curve



Bimetal resistance 30 Ω
This graph shows mean values



Mean initial response time T 25°C

Ordering and marking example

Ordering example standard execution

CD 79 F XXX A B

- **B** – For special identification, supplment letter can be omitted or letter up to Z or figure 1 to 9
- **A** – Code of connections and insulation

Code	Connections	Insulation	Leads
A	on same side	no	no
B	on opposite side	no	no
G	on same side	yes	yes
H	on opposite side	yes	yes

- **XXX** – Temperature value, consisting of 3 figures from 000-160°C
- **F** – Code of the specific resistance of bimetal
- **79** – Basic geometrical measures
- **CD** – Type

Marking example

CD79F	Switch type
100°C ±10 K	Temperature (100°C), tolerance (±10K)
A	Execution

RoHS compliant product

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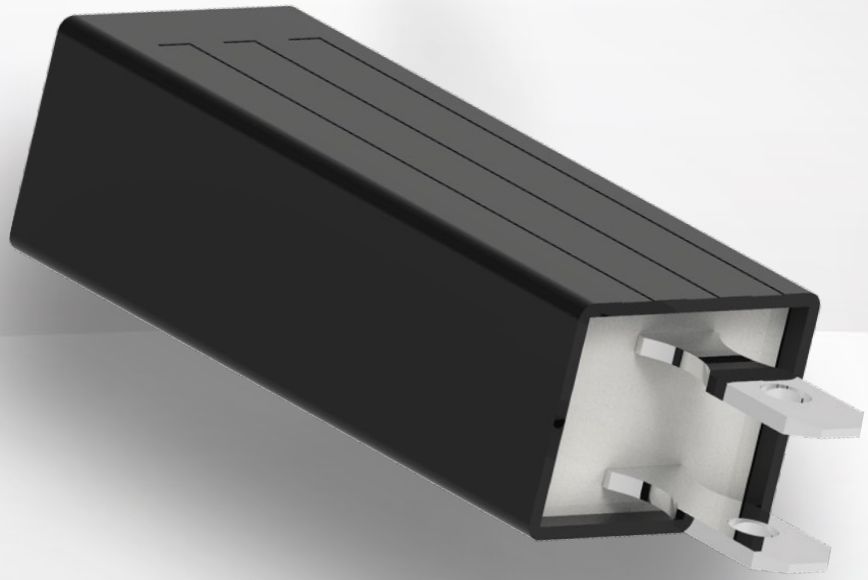
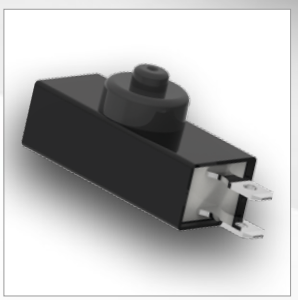
E-Mail: info@microtherm.de
Internet: www.microtherm.de

Deviations from standard controls on request.

MICROTHERM

Current and time based switch
Temperature limiter
Thermostat



Applications

- Household appliances
- Electronics
- Fan heaters
- Automotive industry

Benefits

- More safety by self hold types
- Various housings
- Manual reset
- Customized ratings

Description






Series D switches are based on a **complex system consisting of a contact spring unit and a thermo-bimetal snap-disc**. When heating up to the fixed switching point, the contact opens and thus interrupts the power circuit.

They are very flexible to use: Due to the different types of reset and the adjustable current sensitivity for quick shutdowns, the D switches offer **high quality solutions**, especially in very specific safety concepts.

Temperature switch with an **automatic reset D10**: After a certain cooling phase (temp. hysteresis) the contact switches back automatically.

Temperature limiter with **manual reset D20**: After opening the contacts and the subsequent cooling the contacts remain open until a manual reset is performed on the reset pin.

Temperature switch with **electr. self-hold D30 (230V) / D40 (120V)**: After opening the contacts the switch is heated by a parallel connected resistor and thus kept open. The automatic reset is only performed through a mains disconnection, or off-switching of the device in which the temperature switch is installed.

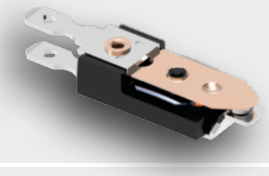
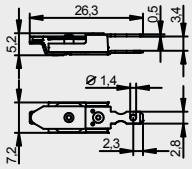
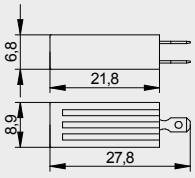
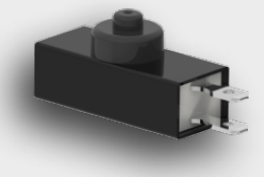
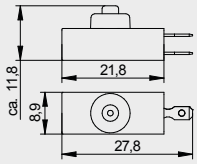
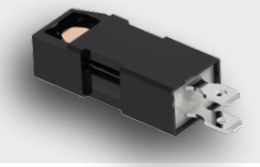
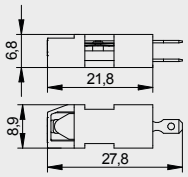
Technical data

type ratings			control			
			D10V	D20V	D30V	D40V
function			automatic	manual	self hold 230 V	self hold 120 V
version			normally closed			
VDE	rated current at 50 / 60 Hz (power factor 0.95 / 0.6)		16 A / 2.5 A (250 V)	16 A / 2.5 A (250 V)	16 A / 2.5 A (230 V)	19.2 A / 2.5 A (120 V)
	switching cycles		10,000	1,000	10,000	8,000
	temperature range T_A (steps in 5 °C)		70 °C ... 160 °C	70 °C ... 130°C / 140 °C	70 °C ... 160 °C	
UL	rated current at 50 / 60 Hz (power factor 1,0 / 0,75)		16 A / 6.3 A (250 V)			16 A / - (125 V)
	switching cycles		6,000			
	temperature range T_A (steps in 5 °C)		70 °C ... 160 °C			
max. current (power factor 0.95)			25 A			
switching cycles under max. current			200			
tolerance			Standard: ± 5 °C			
feature of automatic action			1.B, 2.B	2.B, 2.C	2.C.AK	
contact resistance			< 50 mΩ			
hysteresis / reset temperature [1]			30 °C ± 15 °C / -	- / < -20 °C ; < -10°C	- / < -20 °C [2]	
degree of protection provided by enclosures (EN 60529)			IP00			
suitable for use in protection class			I, II			
approvals	VDE / ENEC		EN 60730-1 / -2-9			
	UL		UL 873			
	CSA		C22.2 No. 24 [3]			
	CQC		GB14536.1-1998 / GB14536.10-1996 [4]			

[1] at the T_A (upper and lower) limits the hysteresis could deviate [2] without air flow [3] different power rating [4] details on request

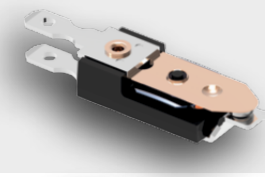
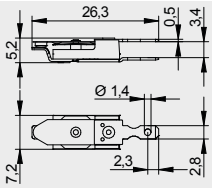
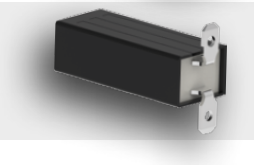
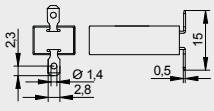
For special applications version P is available with a very low self heating rate.
Manual reset: The maximum operating force must not exceed 6 N. The control should not be reset before the starting conditionsare reached, meaning there should be a satisfactory cooling down time!
Technical data on request.

Versions

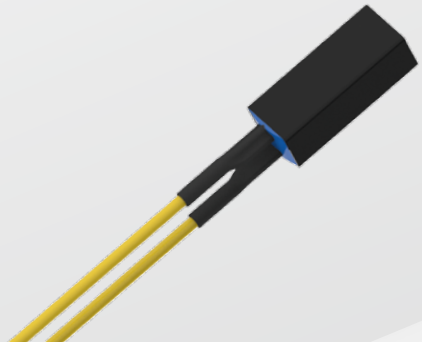
TCO		illustration	drawing dimensions (mm)	technical specification	approvals
standard	current - time based [1]				
D10V	D12V			base of thermoset-ting plastic	VDE, UL, CSA
D10V D30V D40V with housing G115	D12V D32V D42V with housing G115			housing PPS base of thermoset-ting plastic UL: T_A bis 130°C	VDE, UL, CSA
D20V with housing G776	D22V with housing G776			manual reset housing PA/PPS base of thermoset-ting plastic	VDE, UL, CSA
D10V with housing G774	D22V with housing G774			housing PA/PPS base of thermoset-ting plastic	VDE, UL, CSA

[1] For current-time based types (execution D, J, K, L, M, P, R, V) the following information must be provided:

- DC or AC voltage U_N in Volts.
- Continuous operating current I_C in Amps at which the switch must not respond.
- Current level I_0 in Amps at which the switch must respond and the response time t_0 (in seconds ± tolerance).
- Ambient temperatures which could be experienced both in normal operation and in switching conditions.
- Maximum current in Amps.

code	used in TCO	illustration	drawing dimensions (mm)	technical speci-fication	approvals
standard	D10, D12 D20, D22 D30, D32 D40, D42			terminals for soldering CuNi18Zn20 [1]	VDE, UL, CSA
A308	D10, D12 D20, D22 D30, D32 D40, D42			terminals for soldering bent 90° CuNi18Zn20 [1]	VDE, UL

[1] P types have terminals of CuFe2P material



D series switches are also available with lead wires in combination with insulating shrink sleeves.
Technical data on request.

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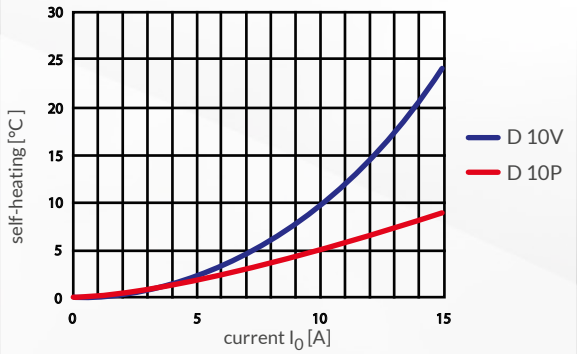
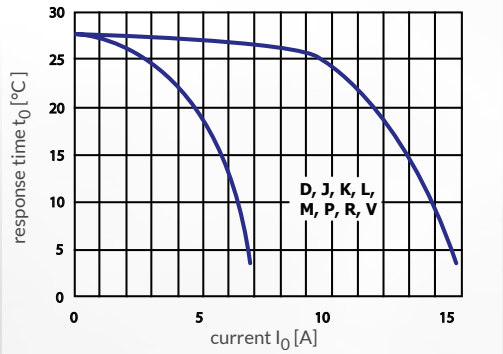
Current vs. self heating



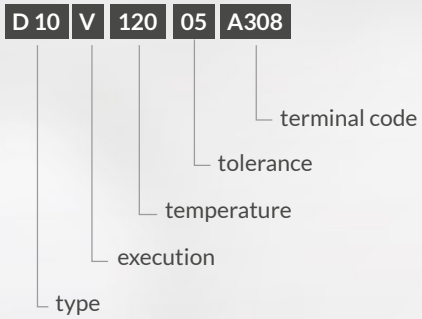
Test conditions:
Measurement in air flow and lead wires of 1.5 mm².

Current vs. response time



TCO variations for current-time based applications.

Ordering example



Marking

D10V	type and execution
E	country (D=Germany)
12005	response temperature (120°C), tolerance (± 5°C)
047	date of manufacture (May 2017)
D12D	type and execution
H	country (H=China)
--123	customized type with drawing number
047	customized type with drawing number

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www.microtherm.de

05/2017-Technical subject to change without notice

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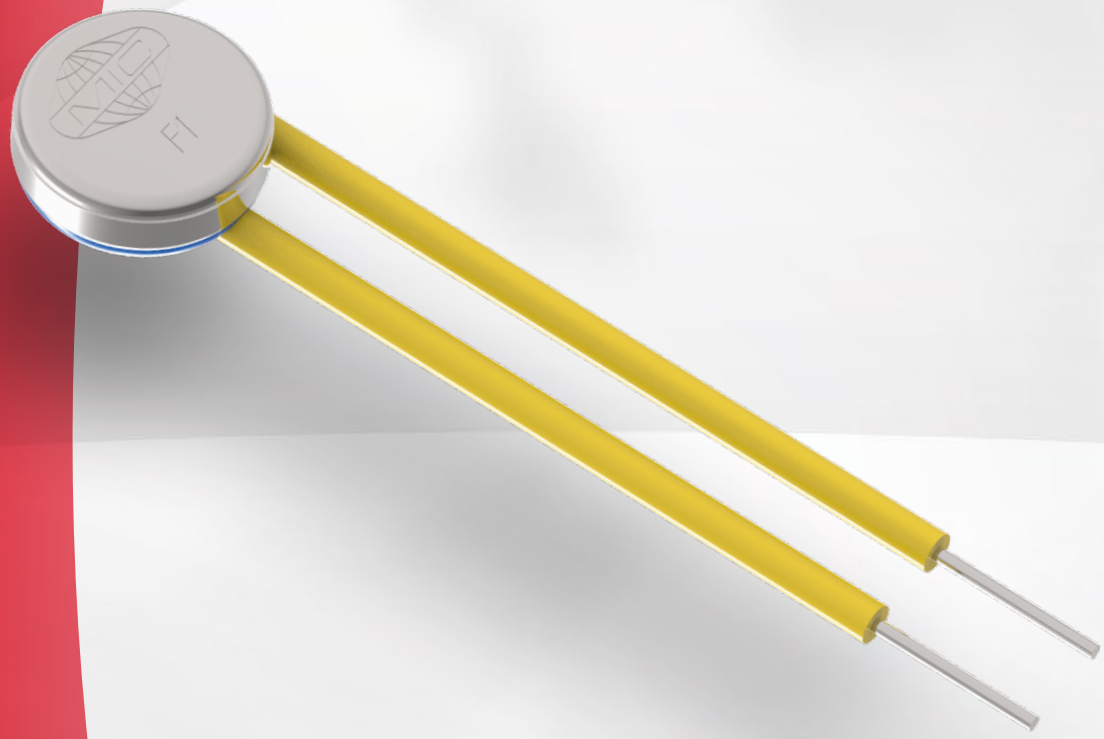
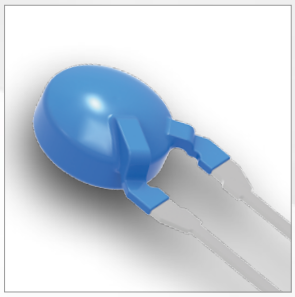
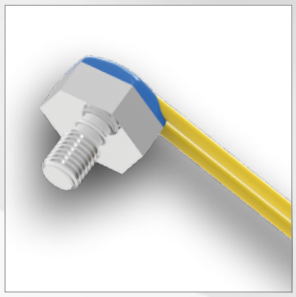
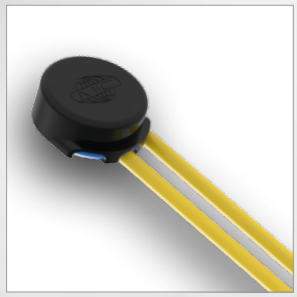
Thermal motor protector
Temperature limiter
Thermal cut-out









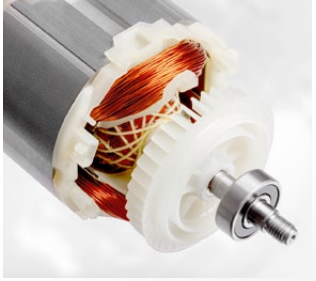
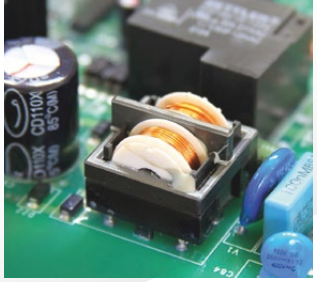
Applications

- Motors
- Transformers
- Coils
- Electronics, sensors

Benefits

- Small dimensions
- Shock and vibration tested
- Leadframe version
- Various kinds of insulations

Description

Switches of the **F series** with a minimum size are very suitable for the **installation in confined conditions**. The switching principle consists of a central contact which opens or closes the circuit of the application when there is a temperature input by means of a pressure spring and a thermo-bimetal snap-disc.

Due to the low mass, a **very fast response** of the switch is possible. The heat is thereby preferably absorbed by the round contact surface of the switch and transmitted to the bimetallic element.

In addition to the direct protection of smaller electrical drives and devices with a rated power of up to approx. 750W, F series switches are often used as **thermal sensors**. In twin or triple configurations, they provide a triggering element in the control circuit for contactors, thus also able to thermally protect **larger three-phase Motors**.

Technical data

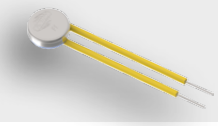
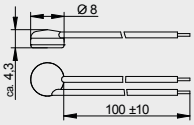
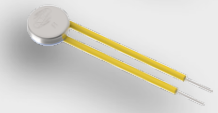
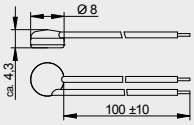
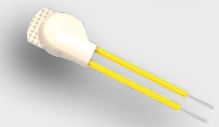
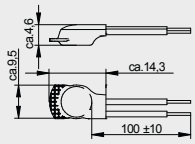
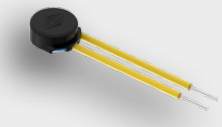
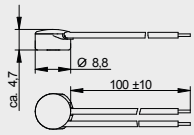
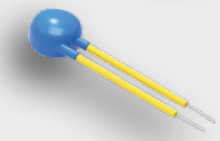
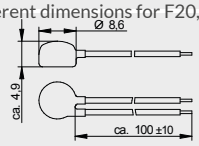
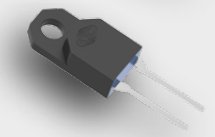
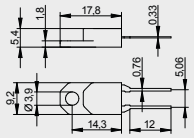
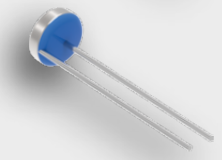
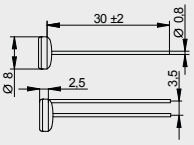
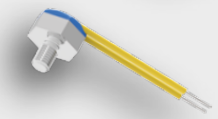
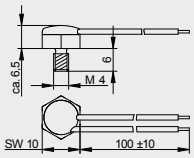
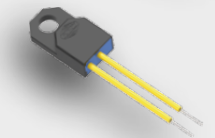
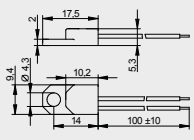
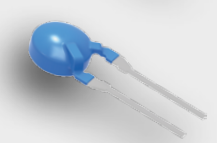
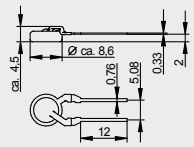
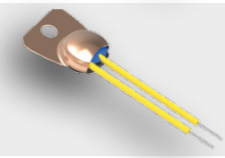
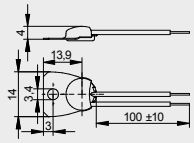
type ratings			control		
			F13A	F23A / E	F20B / G
version			normally closed		normally open
rated current at 250 V 50/60 Hz (power factor 0.95 / 0.6)			3.0 A / 2.5 A	3.0 A / 3.0 A	2.0 A / 1.6 A
switching cycles under rated current			10,000	10,000	7,000
max. current under failure conditions at 250 V 50/60 Hz (power factor 0.95)			4.0 A	6.0 A	4.0 A
switching cycles under max. current			3,000		
temperature rating T_A (steps in 5 °C)			70°C ... 190°C / ... 160°C (CQC)		70°C ... 185°C
tolerances			standard: ± 5 °C		
feature of automatic action			2.C, 1.C		
contact resistance (incl. wire of 100 mm)			< 50 mΩ		
hysteresis			30 K ± 15 °C [1]		
dielectric strength (standard insulation)			2 kV		
shock / vibration testing (similar to EN 50155)			400 m/s² sine half wave / 100 m/s² 5 Hz ... 2,000 Hz sine		
resistances to impregnation			tight against ordinary resins and lacquers		
degrees of protection provided by enclosures (EN 60529)			IP00		
suitable for use in protection category			I, II		
approvals	VDE / ENEC		EN 60730-1 / -2-9		
	UL		UL 2111 / UL 873 [2]		
	cUL		C22.2 No. 77 / C22.2 No. 24 [2]		
	CQC		GB14536.1-2008 / GB14536.10-2008 [3]		-

[1] at the T_A (upper and lower) limits the hysteresis could deviate 2) on request 3) different power rating

The variety of our product variations is nearly infinite. Microtherm distinguishes itself by a high expert's know-how in the area of customised developments. We will be pleased to give you specific advice during a personal consultation and present you all the options suitable for your application:

- application of plug connectors
- unique packaging and overmolding variations
- specific cable assemblies and many more

Versions

control type	n.c.	n.o.	code	illustration	drawing dimensions (mm)	technical specification	approvals
F13	A					not insulated, potted	VDE, UL, cUL
F20 F23	A	B				not insulated, potted	VDE, UL, cUL
F13 F20 F23	A A	B	U254		 different dimensions for F20, F23	shrink cap, potted	VDE, UL, cUL
F13	A		U198		 different dimensions for F20, F23	cap of PPS, potted	VDE, UL, cUL
F20 F23	A	B	U185				
F13 F20 F23	A A	B	U112		 different dimensions for F20, F23	coated T_A max. 160 °C	VDE, UL, cUL
F20 F23	A	B	A150 U280			housing of PPS leadframe leads grid dimension 5.08 potted	VDE, UL, cUL
F13 F20 F23	A A	B	A800		 different dimensions for F20, F23	not insulated, potted	VDE, UL, cUL
F20 F23	E	G	G700			alluminium housing thread M4x6 potted T_A max. 150 °C	VDE, UL, cUL
F13	A		U282			housing of PPS, potted	VDE, UL, cUL
F13 F20 F23	A A	B	A150 U112		 different dimensions for F20, F23	leadframe leads grid dimension 5.08 coated T_A max. 160 °C	VDE, UL, cUL
F13	A	B	B224			CuBe mounting cap combined with U198 / U112	VDE, UL, cUL

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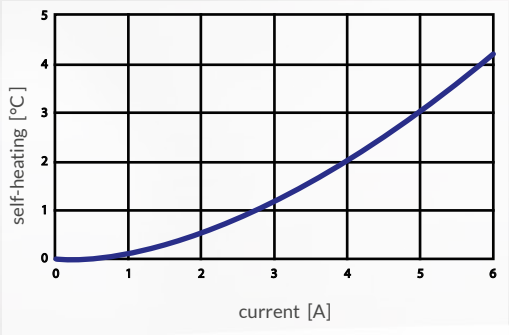
Standard wire

lead	code	temperature max.	operating voltage max.	approx. diameter insulation	approx. cross section / diameter	UL- Style
stranded white	L300	150 °C	300 V	1,50 mm	AWG24 / 0,25 mm²	3398
	L310			1,82 mm	AWG20 / 0,50 mm²	
	L360	200 °C	600 V	1,20 mm	AWG24 / 0,25 mm²	10086
	L370			1,60 mm	AWG20 / 0,50 mm²	
solid yellow	L400	150 °C	300 V	1,35 mm	AWG24 / 0,50 mm	3398
	L410			1,66 mm	AWG20 / 0,80 mm	
	L430	200 °C	300 V	1,16 mm	AWG24 / 0,50 mm	1332
	L440			1,54 mm	AWG20 / 0,80 mm	

Standard length 100 ± 10 mm, stripped 6 ± 1 mm, AWG24 is recommended

Heating by current



The characteristic curve in the diagram is measured with a thermal switch without any insulation in an oil bath.

Note:

The self-heating depends on the thermal conduction of the control to the equipment or part which should be protected.

Ordering example

F13 A 120 05 L300 300 U254

- U254 — shrink cap insulation
- 300 — length 300 mm
- L300 — lead wire white, AWG20
- 05 — tolerance
- 120 — temperature
- A — normally closed
- F13 — type

Marking

F13A type (F13 n.c.)

12005 response temperature (120°C), tolerance (± 5°C)

027D date of manufacture (February 2015), country (D=Germany)

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05/2017-Technical subject to change without notice

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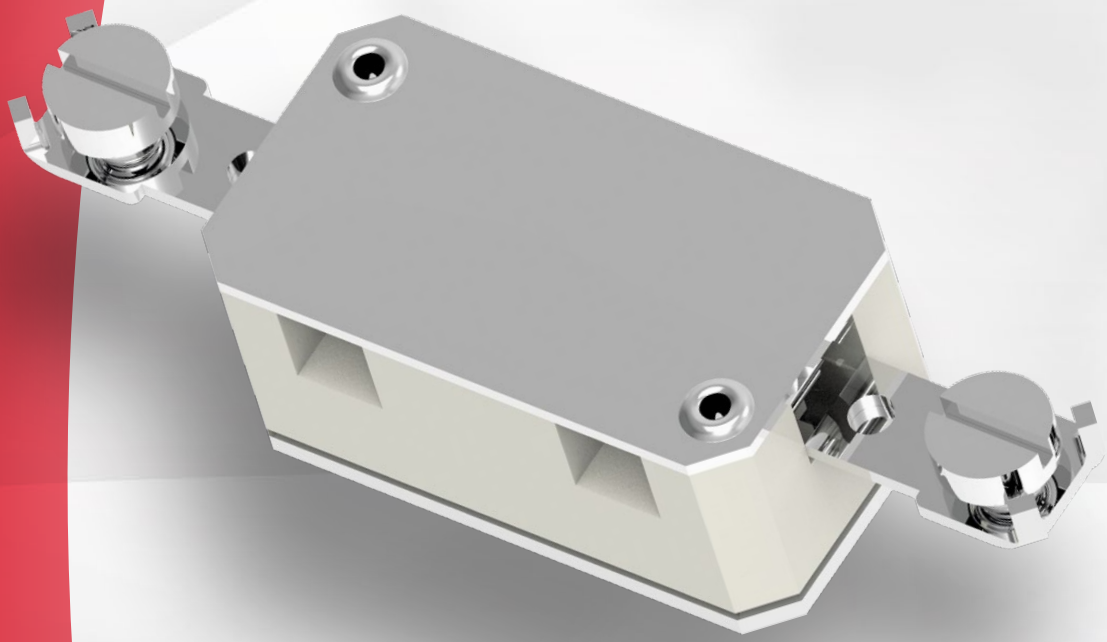
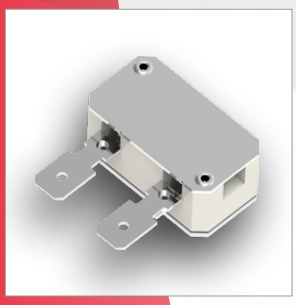
Thermal cut-out
Thermostat

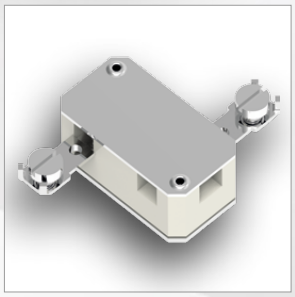
K

1AV

1AT







Applications

- Fuel oil burner
- Welding- /soldering equipment
- Ironing Stations
- Hotplates
- Warming plates

Benefits

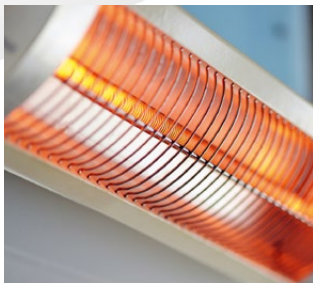
- High temperature materials (ceramic, steel, mikanite)
- Fixed set temperature
- Automatic reset
- Various connection possibilities

Description

High-temperature switches of the **K1 type series** operate in a current-independent manner, and measure the temperature by means of a thermo-bimetal snap-disc. After reaching the defined temperature, the switch opens or closes the circuit of the device to be protected. When the switch-back temperature is reached, the contact system automatically switches back.

K1 switches function as **auxiliary switches**, which convey the temperature across the base plate directly to the bimetallic disc. The base plate and the housing are free of stress.

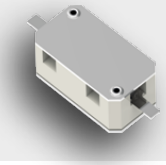
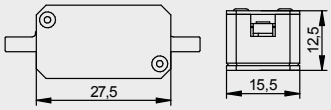


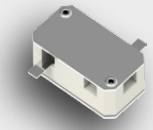
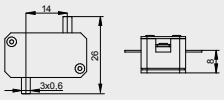
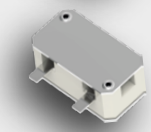
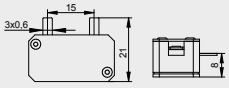
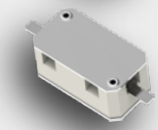
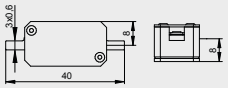
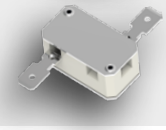
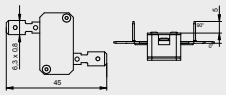
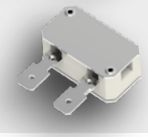
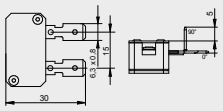
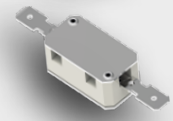
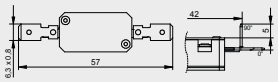
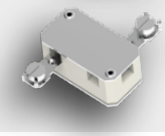
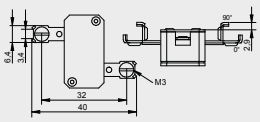
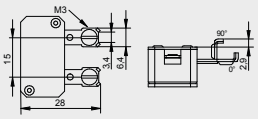
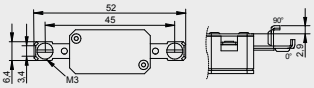
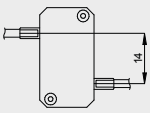
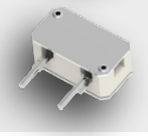
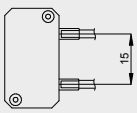
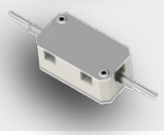
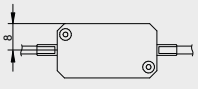
Technical data

ratings			control type	
			K1AV	K1AT
function			automatic	
version			normally closed	normally open
rated current at 230 V 50 / 60 Hz (cos φ 0,95)			10 A	
rated current at 400 V 50 / 60 Hz (cos φ 0,95)			6 A	
switching cycles			10,000	
temperature range T_A (steps in 5 K)			200°C bis 450°C	
tolerances			± 5%	± 10%
feature of automatic action			1.B	
contact resistance			< 50 mΩ	
hysteresis			100K ± 20K	
degrees of protection provided by enclosures (EN 60529)			IP00	
suitable for use in protection class			I	
approval	VDE		EN 60730-1 / -2-9	-

Standard type

type	nc	no	illustration	drawing dimensions (mm)	technical description	approval
K1A	V	T			cover micanite housing ceramic bottom plate steel	VDE

Terminals

code	illustration	drawing dimensions (mm)	technical description	approval (K1AV)
A160			welding terminals, steel	VDE
A170			welding terminals, steel	VDE
A180			welding terminals, steel	VDE
A161 (0°) A162 (90°)			terminals 6.3 x 0.8, steel, also available: angle 90 deg T_A max 350°C	VDE
A171 (0°) A172 (90°)			terminals 6.3 x 0.8, steel, also available: angle 90 deg T_A max 350°C	VDE
A181 (0°) A182 (90°)			terminals 6.3 x 0.8, steel, also available: angle 90 deg T_A max 350°C	VDE
A163 (0°) A164 (90°)			screw terminals, steel, also available: angle 90 deg T_A max 350°C	VDE
A173 (0°) A174 (90°)			screw terminals, steel, also available: angle 90 deg T_A max 350°C	VDE
A183 (0°) A184 (90°)			screw terminals, steel, also available: angle 90 deg T_A max 350°C	VDE
A168			lead L551, welded	VDE
A178			lead L551, welded	VDE
A188			lead L551, welded	VDE

lead L551: UL style 5107, 600V, max. 450°C, insulation glass bre-PTFE, cross-section of conductor 1,3 mm^2 (AWG16) , grey, stripped 10mm

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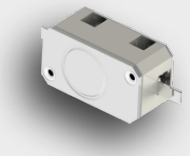
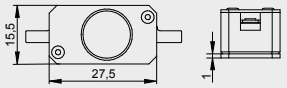
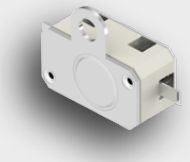
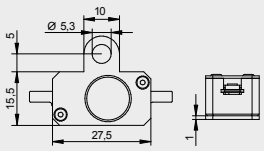
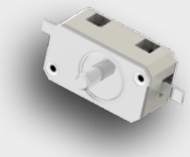
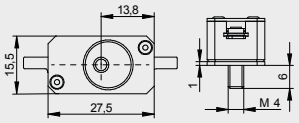
Fixings

code	illustration	drawing dimensions (mm)	technical description	approval (K1AV)
B410			bottom plate, steel	VDE
B412			bottom plate with flange, steel	VDE
B413 (M4x6) B414 (M5x6)			bottom plate with stud, steel	VDE

Ordering example

K1A | V | 300 | 15 | L551 | 250 | A168 | B413

- B413: bottom plate, stud of M4x6
- A168: lead L551, welded
- 250: length of lead 250 mm
- L551: lead (details see previous page)
- 15: tolerance
- 300: temperature
- V: contact execution (V=normally closed / T=normally open)
- K1A: type (housing ceramic, cover micanite)

Marking

K1AV 30015	type (normally closed) response temperature (300°C), tolerance (+/- 15K)
XXXXX	production number
K1AT --123	type (normally open) drawing number
XXXXX	production number

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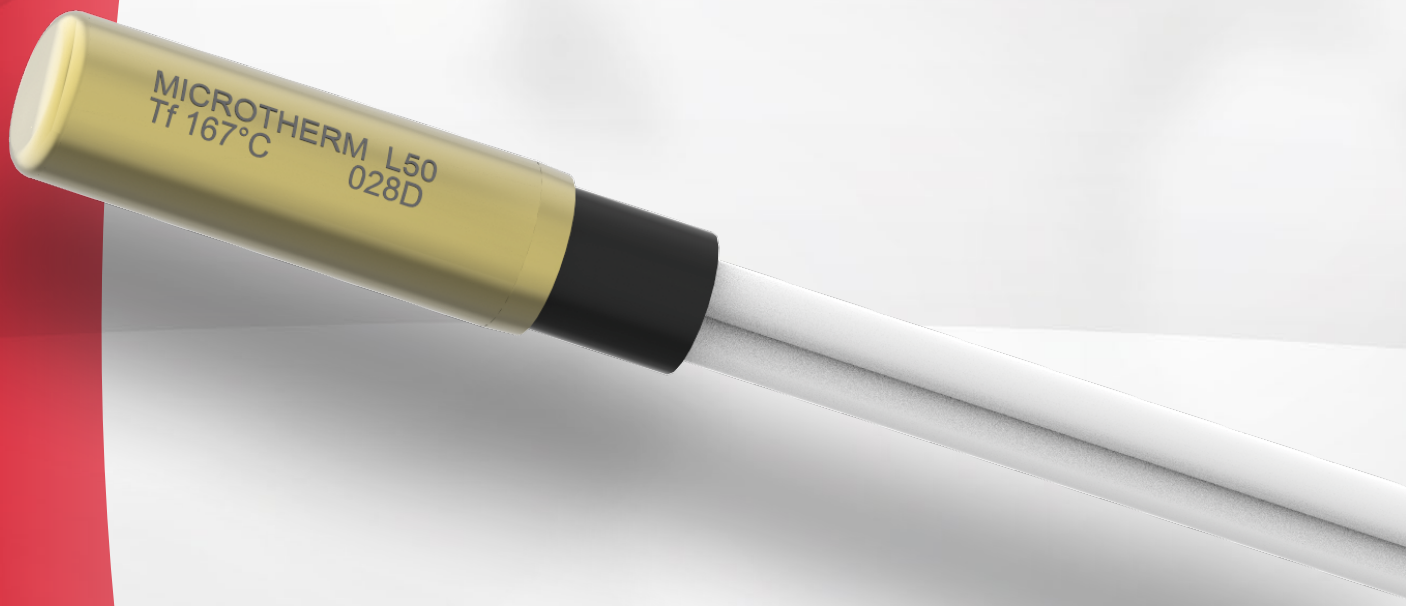
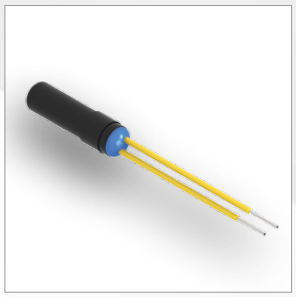
Temperature probe
Thermal cutout

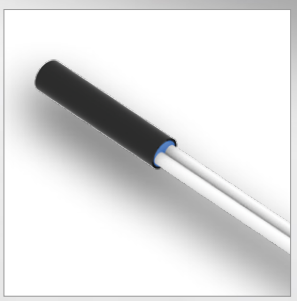
Type

L10

L50







Applications

- electronic applications
- E-car plug connectors
- Room ventilation and fire protection system sensor
- Heating elements protection

Benefits

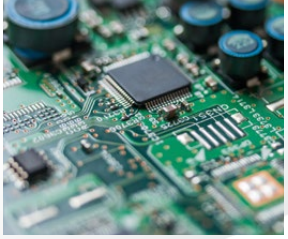
- Fully insulated solution
- Plug-in capable
- Direct or indirect shutdown of device
- Smallest and customized design

Description

Thermal cutouts and probes of these types are universally applicable due to their small design and wide range of variations.

Basically, they are divided in the L10 series for applications in the area of signal currents up to max. 8A and the L50 series with up to max. 25A and 240°C. The elements are very easy to apply, characterized by their given constructive electrical insulation, the mechanical robustness and the already existing lead wire connection. When triggered by temperature – thanks to their small size – they react very quickly.

The internal structure of the elements is based on a melting element, which will liquefy when reaching a certain temperature level. The internal contact spring will relax and thus separate the electric contact system.



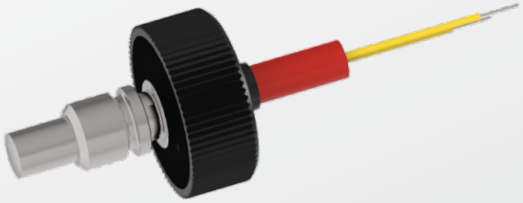
Standard wire

type	lead	code	temperature max.	operating voltage max.	approx. diameter insulation	approx. cross section / diameter	UL- Style
L10	stranded white	L360	200°C	600 V	1,20 mm	AWG24 / 0,25 mm^2	10086
L10 G911		L370			1,60 mm	AWG20 / 0,50 mm^2	
L50		L380			1,80 mm	AWG18 / 1,00 mm^2	
L50	solid yellow	L440		300 V	1,54 mm	AWG20 / 0,80 mm	1332

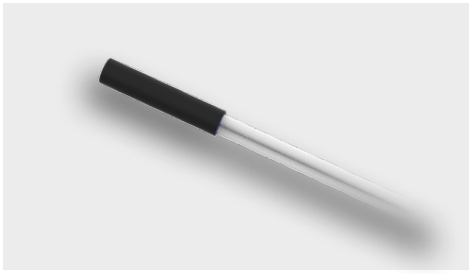
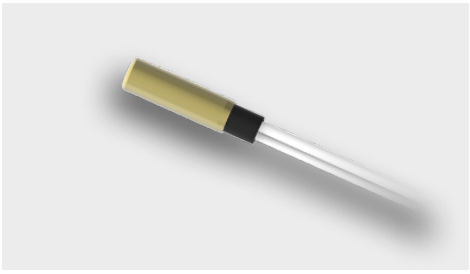
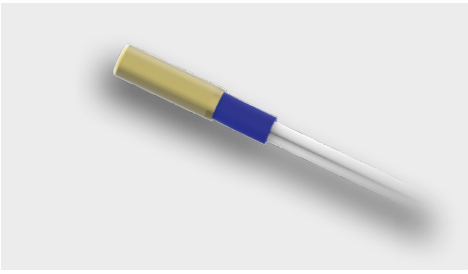
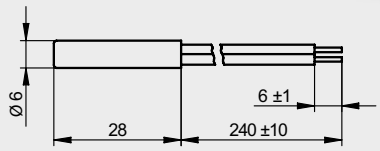
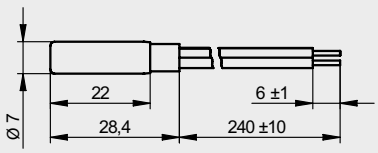
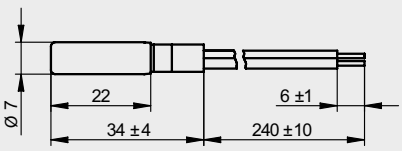
L50: Standard length 240mm, stripped 6 ± 1mm
L10: Standard length 40mm, stripped 6 ± 1mm

T_f	**Rated Functioning Temperature:** The maximum temperature at which the thermal cutoff changes its state of conductivity to open circuit with sensing current as the only load. The rated functioning temperature is measured during a temperature rise of approximately 0.5°C per minute.
T_h	**Holding Temperature:** Maximum temperature of the TCO measured at the case end of the thermal cutoff at which the thermal cutoff can be maintained for a period of 168 hours without opening. General note: It is advised that TCOs are not exposed to continuous operating temperatures in excess of higher than Tf -25°C.
T_m	**Maximum Overshoot Temperature:** The maximum temperature at which the thermal cutoff, having changed its state of conductivity, can be maintained at twice rated voltage for a specified period of time, during which its mechanical and electrical properties will not be affected.

In addition to the executions shown below, many other customized solutions are available, e.g. with clip or screw-in housings.
Please contact us.



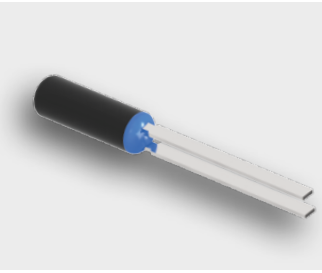
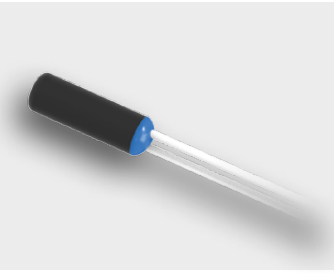
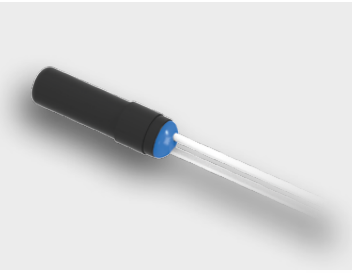
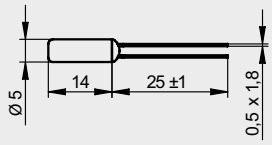
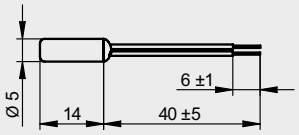
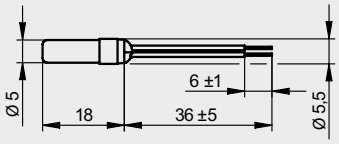
L50 Series

L50N G900 (max. 184 °C)	L50N G902 (max. 184 °C)	L50N G913 (max. 240 °C)
		
		

	L50N 10A (Standard)		L50N 20A	
T_f (Tolerance +0 / -10°C)	T_h	T_m	T_h	T_m
70	55	130	55	175
72	57	100	57	175
77	62	125	62	200
84	69	125	69	200
91	-	-	-	-
93	78	140	78	215
98	83	140	83	215
100	85	140	85	215
104	89	150	89	225
110	95	150	95	225
117	102	160	102	235
119	-	-	-	-
121	106	160	106	235
128	113	205	113	235
141	-	-	-	-
144	129	240	129	250
152	137	205	137	250
167	154	240	152	285
170	-	-	-	-
172	157	240	157	350
184	169	210	169	350
190	175	310	175	350
192	177	210	177	350
205	189	310	189	375
216	200	375	200	375
228	-	-	-	-
229	200	375	200	375
240	200	450	200	375

Note: For the technical selection of temperature cutouts in the L50 series, especially in applications with high currents, it is necessary to consider the self-heating of the components. This self-heating effect depends on the thermal connection of the cutout to the environment. The inner cutout elements are UL and VDE approved. Details on request.

L10 Series

L10N (Lead frame terminals, 8A)	L10N (Leads or solid wires, 3A)	L10N G911 (Add. mechan. support, leads or solid wires, 8A)
		
		

	L10N 3A, 8A	
T_f (Tolerance +0 / -10°C)	T_h	T_m
71	55	175
77	55	175
85	55	175
90	60	175
100	70	175
108	78	175
118	88	175
130	100	175
140	110	175
150	120	175

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MIC® Microtherm International Cooperation

MICROTHERM

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Temperature controller
Temperature limiter

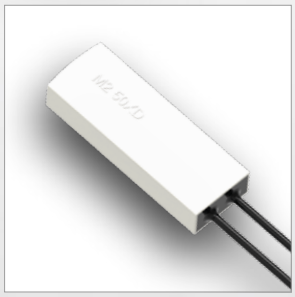
M

MQT8K

MQT8H

M3

M2



Applications

- Electrical controllers
- Air conditioner and floor heating
- Antifreeze
- Curing tube
- Additional heaters for sensor systems in cold countries

Benefits

- Highest precision
- Low tolerance, small hysteresis
- Long-life (2 mio. mechan. switching cycles)
- splashproof
- electric. insulated plastic housing

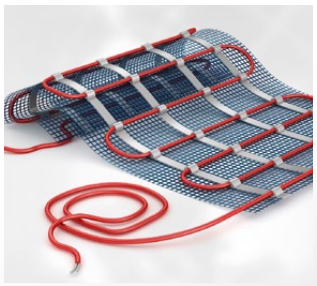
Description

With response temperatures between -10°C to 110°C (special version up to 160°C), long-life and a splash-proof housing, the **M-series** is characterized as a very reliable switch series in terms of regulation.

Possible applications include control electronics, air conditioning, underfloor heating and frost protection. In particular, however, in the area for the **control of additional device heaters**.

By using these **reliable electromechanical switches**, an entire system of temperature sensors, evaluation and switching electronics can be saved. Typical risks in electronic solutions (such as solder errors on PCBs, failure of electronic components) are eliminated using this pure electro-mechanical system. Switches can easily be screwed on surfaces, a simple method of handling is guaranteed.



Technical data

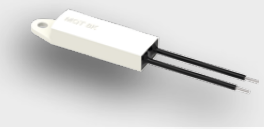
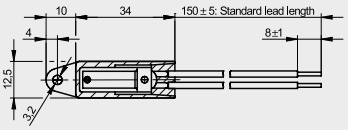
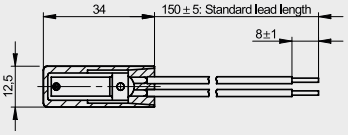
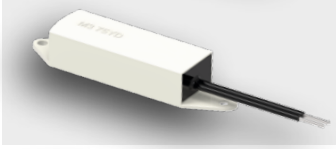
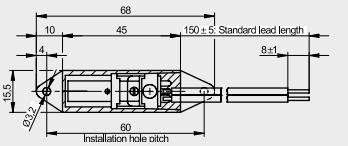
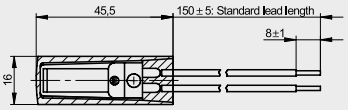
ratings		switch type			
		MQT 8K	MQT 8H	M3	M2
function	normally closed contact	when temperature is increasing, the contacts will be opened and disconnect the current			
	normally open contact	when temperature is increasing, the contacts will be closed and activate the current			
	reset	reset is done automatically			
contact configuration		X (normally closed contact) Y (normally open contact)		X (normally closed contact) Y (normally open contact) Option: switch over contact Z (3 leads XZ or YZ)	
approval according to VDE EN 60730-1 /-2-9	response temperature	-10°C ~ +110°C		-10°C ~ +110°C	
	current / voltage	2.0 A / AC 125 V 1.3 A / AC 250 V 2.0 A / DC 12 V 1.3 A / DC 24 V 0.6 A / DC 48 V		5 A / AC 125 V 3 A / AC 240 V 5 A / DC 12 V 3 A / DC 24 V 0.8 A / DC 48 V	
	lifetime	10,000 life cycles		10,000 life cycles	
approval according to UL 873	response temperature	-10°C ~ +100°C		-10°C ~ +110°C	
	current / voltage	2 A / AC 125 V		5 A / AC 125 V	
	lifetime	10,000 life cycles		30,000 life cycles	
ambient temperature range		-30°C ~ +85°C (standard) -30°C ~ +125°C (special) use within 60° above the response temperature, no icing and no condensing			
contact resistance		< 70 mΩ			
withstanding voltage		2.000 V AC/2 sec.			
insulation resistance		min. 100 MΩ			
vibration resistance		according to JIS-C-0911-1984 constant 50 Hz: 0,2 mm=1G 10 - 55 Hz: 0,35 mm fixed 2 h in X,Y and Z-direction = 0,1G to 2,2G (according to tolerance class)			
guaranteed lifetime according to manufacturer		mechanical cycles: 2,000,000 electrical cycles at rated load: 100,000			
suitable for use in protection category		I, II			
water tightness		waterproof by resin cover, increased waterproof by double sealed construction on request			
standard wiring		AWM1015/AWG22 black150mm length <+75°C AWM3271/AWG22 gray 150mm length >+76°C		AWM1015/AWG20 black150mm length <+75°C AWM3271/AWG20 gray 150mm length >+76°C	
guidelines and norms		WEE 2002/95 EG RoHS-conformity, REACH-conformity production according to DIN EN ISO 9001			

Tolerance of setting temperature and differential vs. setting temp.

2 Amp. series MQT 8K and MQT 8H as well as 5 Amp. series M3 and M2										
response temperature	-10°C ~ -1°C		0°C ~ +50°C		+51°C ~ +65°C		+66°C ~ +75°C		+76°C ~ +110°C	
execution / differential	X	Y	X	Y	X	Y	X	Y	X	Y
A: 3.5±1.5 (2~5)°C	-	-	±3	±3	-	-	-	-	-	-
B: 4.5±1.5 (3~6)°C	±4	±4	±3	±3	±4	±4				
C: 6.5±1.5 (5~8)°C	±4	±4	±3	±3	±4	±4	±5	±5		
D: 10±2 (8~12)°C	±4	±4	±4	±4	±5	±5	±5	±5	±5	±5

Note: 1. Above list is valid for standard tolerance 2. Special tolerance ±1.5K or ±2K are available on request

Standard types

switch type	illustration	drawing dimensions (mm)	technical Specification
MQT 8K			standard execution, flat (6.4 mm), with 1 fixing eyelet, with 2 leads, 44x12.5x6.4mm **option:** execution MQT 8KT with tab terminals
MQT 8H			standard execution, flat (6,4 mm), without fixing eyelet, with 2 leads, 34x12.5x6.4mm **option:** execution MQT 8HT with tab terminals
M3			standard execution (10.8 mm), with 2 fixing eyelets, hole distance 60 mm, with leads: execution X or Y with 2 leads, 68x15.5x10.8mm **option:** execution M3Z with 3 leads (switch over contact XZ or YZ)
M2			standard execution (7.5 mm), without fixing eyelets, with 2 leads, 45.5x16x7.5mm **option:** execution M2F with fuse installed

Contact capacity by voltage used and by differential ranking

type			MQT 8	M3	M2	low current applications with crossbar contact (only for MQT)
voltage / max. current		differential	max. current (100.000 life cycles)	max. current (100.000 life cycles)	max. current (100.000 life cycles)	max. current (100.000 life cycles)
-	DC 48V	A: 3.5±1.5 (2~5)°C	50mA – 0.3A	0.1A – 0.3A	-	1mA – 49mA
		B: 4.5±1.5 (3~6)°C	50mA – 0.3A	0.1A – 0.5A	-	
		C: 6.5±1.5 (5~8)°C	50mA – 0.3A	0.1A – 0.8A	-	
		D: 10±2 (8~12)°C	50mA – 0.6A	0.1A – 0.8A	0.1A – 0.8A	
AC 250V	DC 24V	A: 3.5±1.5 (2~5)°C	50mA – 0.6A	0.5A – 1.5A	-	1mA – 49mA
		B: 4.5±1.5 (3~6)°C	50mA – 0.9A	0.5A – 2A	-	
		C: 6.5±1.5 (5~8)°C	50mA – 1.3A	0.5A – 3A	-	
		D: 10±2 (8~12)°C	50mA – 1.3A	0.5A – 3A	0.5A – 3A	
AC 125V	DC 12V	A: 3.5±1.5 (2~5)°C	50mA – 1.0A	0.5A – 3A	-	1mA – 49mA
		B: 4.5±1.5 (3~6)°C	50mA – 1.5A	0.5A – 4A	-	
		C: 6.5±1.5 (5~8)°C	50mA – 2.0A	0.5A – 5A	-	
		D: 10±2 (8~12)°C	50mA – 2.0A	0.5A – 5A	0.5A – 5A	

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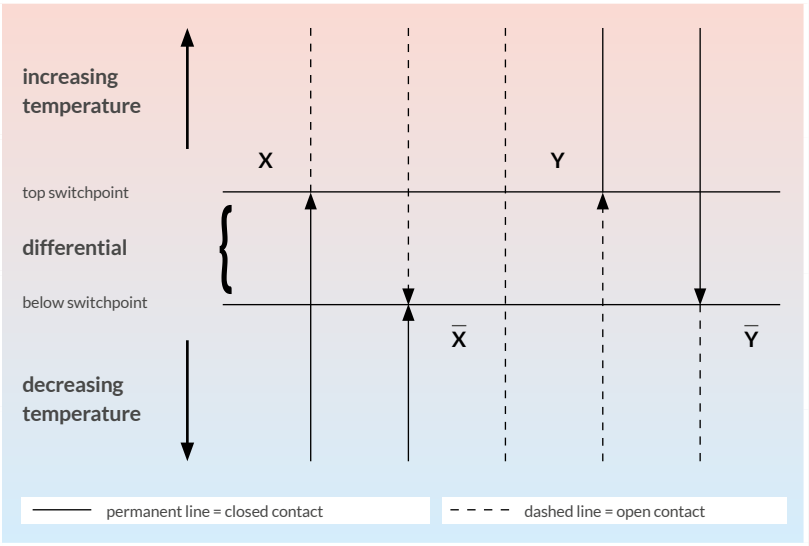
Contact types

X normally closed	contact opens when temperature is increasing
$\overline{X}$ normally closed	contact closes when temperature is decreasing
Y normally open	contact closes when temperature is increasing
$\overline{Y}$ normally open	contact opens when temperature is decreasing



Ordering and marking example

Ordering example for standard execution

MQT 8 K 10X C

- C — code letter for differential rate
- 10X — response temperature and contact configuration
- K — fixation
- 8 — type number
- MQT — type

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05/2017-Technical subject to change without notice

MICROTHERM

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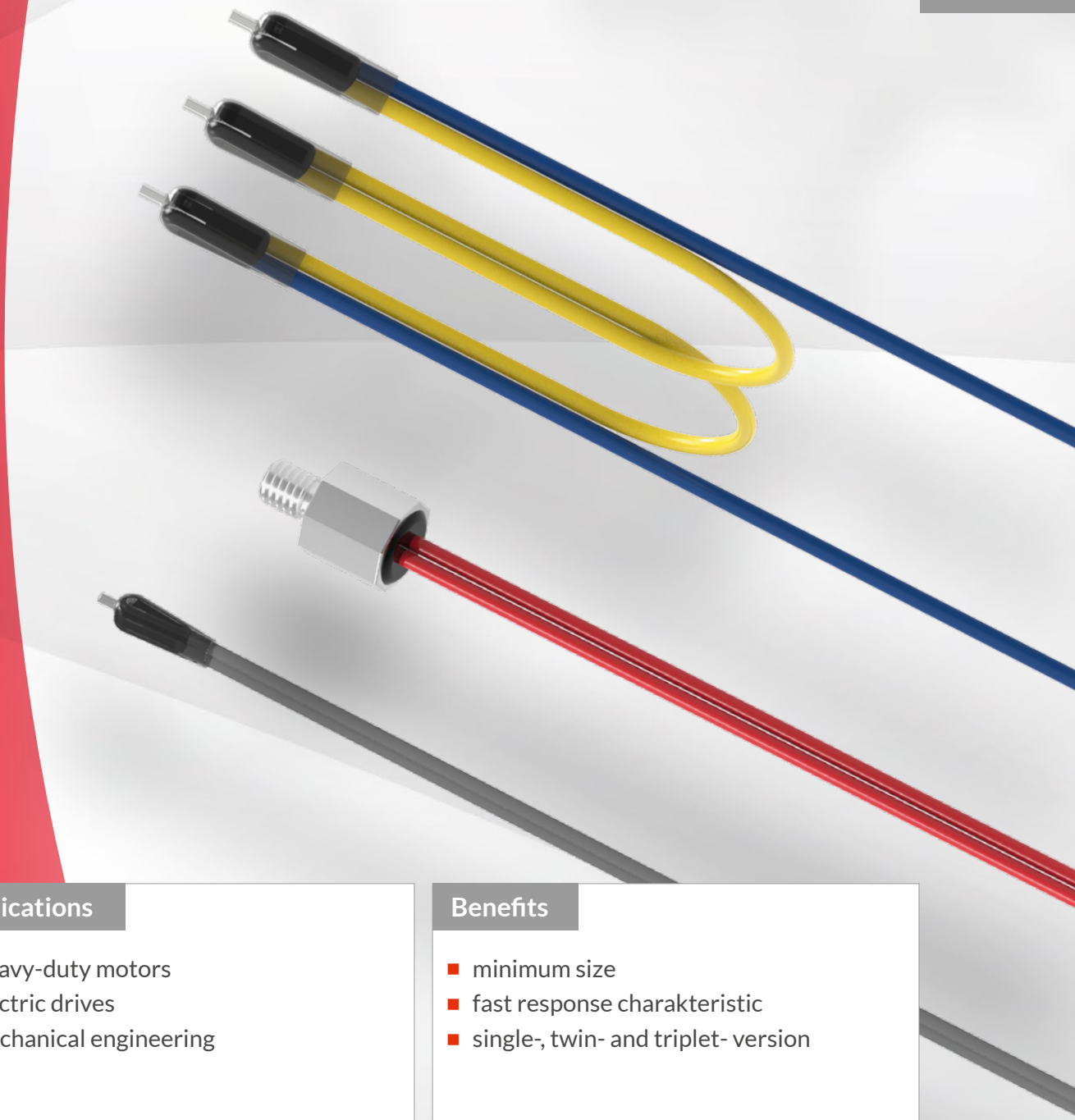
PTC-Temperature-Sensors
PTC Thermistors, Motor-PTC
Single- and Triplet- Version

type
YAM
EF1



Applications

- Heavy-duty motors
- electric drives
- mechanical engineering

Benefits

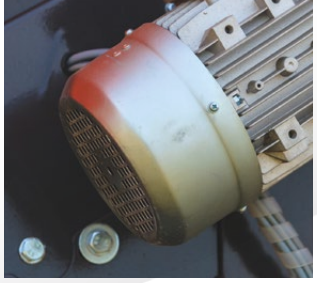
- minimum size
- fast response charakteristic
- single-, twin- and triplet- version

Description

PTC-temperature sensors are used for thermal protection of electric machinery and control cabinets, especially electric motors. The structure ensures a fast response time and a simple installation.

The function is obtained by a strong nonlinear PTC effect of the resistor. The usable range is ± 5 K around the nominal temperature. The evaluation is carried out by means of an electronics which detects the sudden increase in resistance and initiates a corresponding action (throttling, shutdown, etc.).

The thermistors are designated according to their nominal switch-off temperature T_{NAT}. Whereas the range below T_{NAT}-20 is not defined. Standards for single / triplet PTC thermistors are DIN 40081/40082.

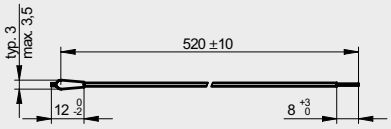
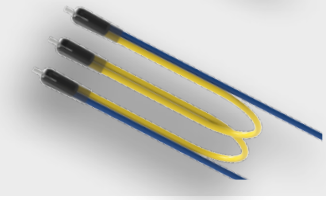
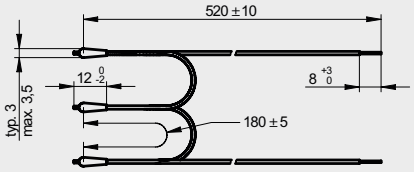
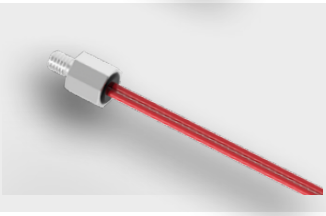
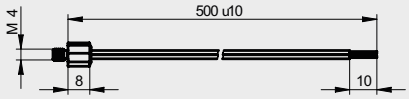



Technical data

Description	Dimensions	
	Single thermistor: YAM1, EF1	Triplet thermistor: YAM3
Nominal response temperature	80 °C ... 180 °C (add. 145 °C and 155 °C)	
Maximum allowable operating temp.	200 °C	
Maximum allowable operating voltage	25V (+25°C)	
Maximum allowable power dissipation	690 mW (+25 °C)	
Resistance R_{25}	≤ 100 Ω	≤ 300 Ω
Resistance at T_{NAT} -5 K	≤ 550 Ω	≤ 1.650 Ω
Resistance at T_{NAT} +5 K	≥ 1.330 Ω	≥ 3.990 Ω
Resistance at T_{NAT} +15 K	≥ 4.000 Ω	≥ 12.000 Ω
Tolerance of T_{NAT}	±5K	±5K
Dielectric strength	2,5 KV AC	
Connection line	PTFE-insulated leads AWG26	
Length of connecting leads	520 mm ± 10mm	520-180-180-520 mm ± 10mm

YAM: PTC-pill with shrink tube and epoxy resin
EF1: PTC-pill with screw housing with M4- or M6-thread

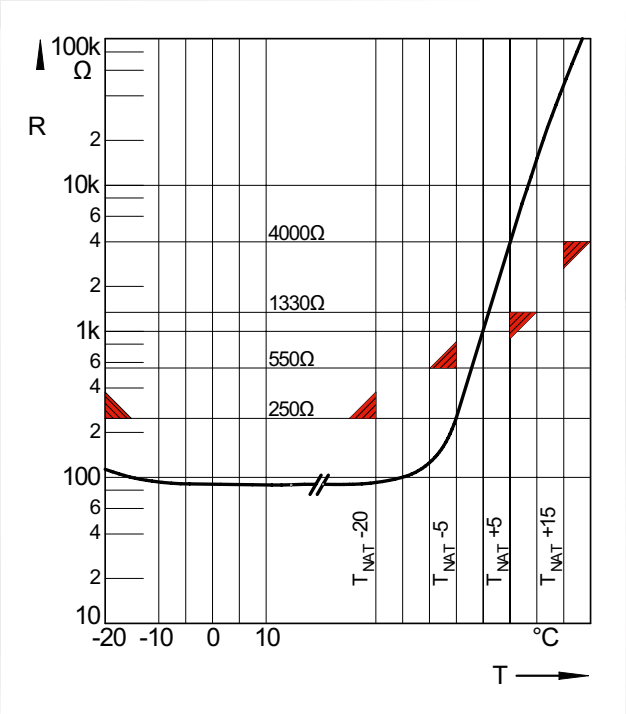
Versions

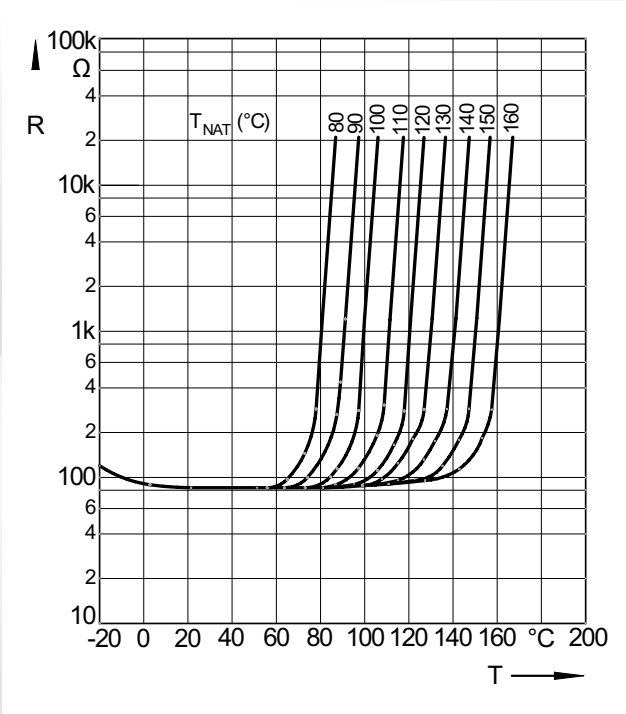
type	illustration	drawing dimensions (mm)	technical specification
YAM1			shrink tube and epoxy resin
YAM3			shrink tube and epoxy resin
EF1			srew housing with M4- oder M6-thread

Identification color (leads)

type	T_{NAT} °C	YAM1, EF1: single-PTC standard ID-color	YAM3: triple-PTC standard ID-color
YAM EF1	80	white-white	white-yellow-yellow-white
	90	green-green	green-yellow-yellow-grün
	100	red-red	red-yellow-yellow-red
	110	brown-brown	brown-yellow-yellow-brown
	120	gray-gray	gray-yellow-yellow-gray
	130	blue-blue	blue-yellow-yellow-blue
	140	white-blue	white-yellow-yellow-blue
	145	white-black	white-yellow-yellow-black
	150	black-black	black-yellow-yellow-black
	155	blue-black	blue-yellow-yellow-black
	160	blue-red	blue-yellow-yellow-red
	170	white-green	white-yellow-yellow-green
	180	red-white	red-yellow-yellow-white

Temperature-resistance curve





Ordering example

YAM3	120 05	520	180 180	520
Type triplet	T_{NAT} (°C) and tolerance	Lead wire 1	Connecting lead wires	Lead wire 2

Also versions in twins are possible.
Deviations from the standard generally on request.

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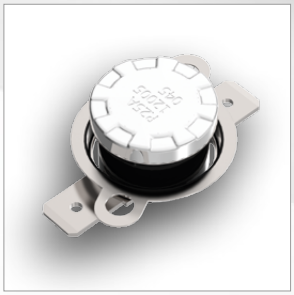
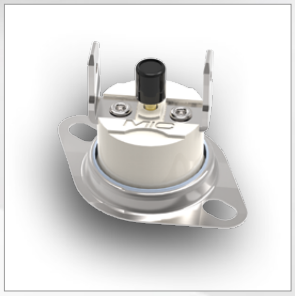
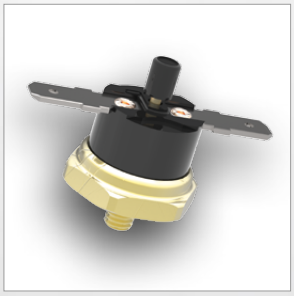
MICROTHERM

Thermal cut-out thermostat
Automatic or manual reset

R







Applications

- Cooking devices
- Electric grill
- Heaters and heating Elements
- Antifreeze
- Diesel preheating (automobile)

Benefits

- High current and high temperatures
- Low tolerances up to ±3K
- various attachments
- Low hysteresis up to 10K
- Up to 100,000 circuits

Description

Switches of the **R series** are extremely robust switches with universal characteristics: they can be used as temperature monitors and controllers, current-capable up to 16 A, specifically adjustable hysteresis and low tolerances up to ± 3K.

The plastic housing, the floor and the fastening are tension-free. The heat is applied directly to the thermo-bimetallic snap-disc via the contact surface (bottom), and thus allows a very rapid reaction. The connections vary in dimensions and mounting angles (0 - 90°).

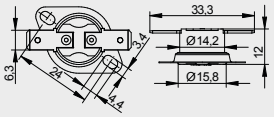
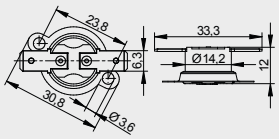
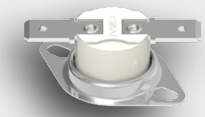
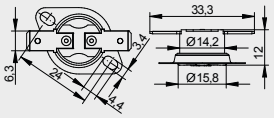
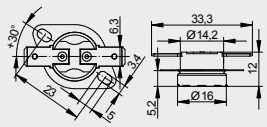
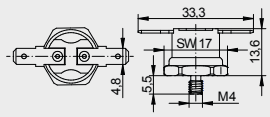
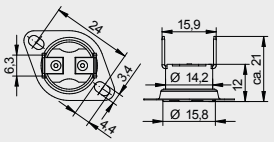
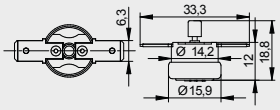
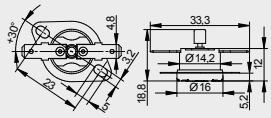
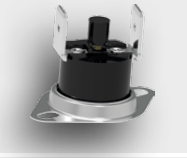
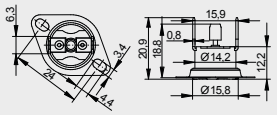
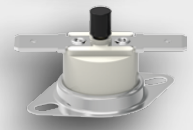
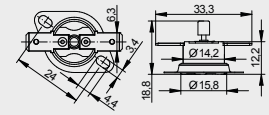
Types R25 and R26 are automatically resetting, whereas types R35 and R36 are manual-resetting switches.

Delivery quantities from 2,000 pcs.

Technical data

ratings			type			
			R25A	R26A	R35A	R36A
reset			automatic		manual	
contact version			normally closed			
VDE	rated current at 250V AC		10 A	16 A	16 A	16 A
	switching cycles		100,000	30,000	10,000	10,000
	max. temperature range T_A (steps in 5 K)		0°C ... 150°C	0°C ... 210°C	45°C ... 150°C	45°C ... 180°C
UL	rated current at 250V AC		16 A	10 A	10 A	10 A
	switching cycles		6,000	100,000	6,000	6,000
	max. temperature range T_A (steps in 5 K)		0°C ... 160°C	0°C ... 230°C	45°C ... 150°C	45°C ... 180°C
tolerance			± 3 K (< 130°C) ± 5 K (< 210°C)		± 3 K (45°C ... 95°C) ± 4 K (96°C ... 150°C)	
feature of automatic action			1.C		2.B	1.B
contact resistance			< 30 mΩ			
hysteresis	0°C ... 130°C 10K 131°C ... 159°C 15K 160°C ... 190°C 15K 191°C ... 230°C 15K		10K ±5 K 15K ±5 K 15K ±7 K 15K ±10 K		---	
suitable for use in protection class			I, II			
approvals	VDE		EN60730-1 / -2-9 UL60730-1, UL60730-2-9, UL873, CAN/CSA-E60730-1, CAN/CSA-E730-2-2 / -2-9			
	UL					
	CQC		GB14536.1 / GB14536.10	---	---	---

Versions

code	illustration	drawing dimension (mm)	technical description
R25A 121 B14 H131			terminals 6.3 x 0.8 mm, aluminium cap, standard bracket (loose)
R25A 121 B14 H211			terminals 6.3 x 0.8 mm, aluminium cap, standard bracket (loose)
R26A 121 B14 H131			ceramic switch, terminals 6.3 x 0.8 mm, aluminium cap, standard bracket (loose)
R25A 121 A211			terminals 6.3 x 0.8 mm, fixed, raised bracket in aluminium, fixed at ±30° resp. ±45°
R25A 321 D43			terminals 4.8 x 0.8 mm, screwed connections M4 x 5.5 mm, brass
R25A 111 B14 H131			bent terminals 6.3 x 0.8 mm, aluminium cap, standard bracket (loose)
R35A 121 B34			manual reset, terminals 6.3 x 0.8 mm, steel cup for low temperatures
R35A 321 A211			manual reset, terminals 4.8 x 0.8 mm, fixed, raised bracket in aluminium, fixed at ±30° resp. ±45°
R35A 111 B14 H131			manual reset, bent terminals 6.3 x 0.8 mm, aluminium cap, standard bracket (loose)
R36A 121 B14 H131			manual reset, ceramic housing, terminals 6.3 x 0.8 mm, aluminium cap, standard bracket (loose)

Please contact us for the combination of various executions with regard to terminals and fixations.

MIC® Microtherm International Cooperation

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Ordering example

R25 | A | 120 | 03 | 121 B14 H131

- R25 — Microtherm type
- A — type of contact
- 120 — temperature
- 03 — tolerance
- 121 B14 H131 — terminal / cap / fixing

Marking

R25A	tye R25 normally closed (UL, CQC, VDE)
12005	response temperature (120°C), tolerance (± 5K)
036	date of manufacture (May 2016)

or:

R25A	type R25 normally closed (VDE, UL, CQC)
--123	drawing number (range 001 to 999)
036	date of manufacture (June 2016)

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MICROTHERM

MICROTHERM

Thermal cut-out thermostat
Automatic or manual reset




Applications

- Domestic appliances
- Coffee machines
- Heaters and heating Elements
- Antifreeze
- Diesel preheating (automobile)

Benefits

- Ceramic housing available for high temperatures
- Low tolerances up to ± 3K
- various attachments
- Low hysteresis up to 10K

Description

The **R27/R28/R29** temperature switches are very reliable bimetal technology components, offering a long life time. The normally closed contacts open when reaching the predefined temperature by snapping of a bimetal disc. Temperature setting is defined through conditioning (aging, stamping, ...) of the disc. After a corresponding cooling down, the bimetal disc snaps back to the original position and closes the current circuit again or remains in open position until manually reset. These R27/R28/R29 types are perfect **surface mount components**, offering high temperature sensibility and can be used in a wide range of white goods, automotive technology, mechanical engineering, kitchen devices.




Technical data

ratings			type						
			03EN	52N	60EN[1]	05EN	15N	23EN
function			automatic			manual reset		
version			normally closed (n.c.) / normally open (n.o.)			normally closed (n.c.)		
VDE	rated current 250V AC (cos φ 0,95)		16 A	10 A	16 A	250 V AC, 10 A 1.000 switching cycles 0°C ...100°C	16 A	16 A	16 A
	switching cycles		30,000	100,000	10,000		3,000	6,000	3,000
	temperature T_A (steps in 5 K)		max. 150°C	max. 150°C	max. 230°C[2]		max. 150°C	max. 250°C	max. 150°C
UL	rated current 240V AC (cos φ 1,0)		---	10 A	250 V, 10 A		10 A	16 A	10 A
	switching cycles		---	100,000	100,000		6,000	6,000	6,000
	temperature T_A (steps in 5 K)		---	max. 150°C	max. 230°C		40°C ..150°C	40°C ..250°C	40°C ..150°C
tolerance			T_A <100°C: ±3 K / T_A ≥100°C: ±4 K / T_A >140°C: ±5 K / T_A ≥170°C: ±8 K / T_A ≥200°C: ±10 K			T_A<100°C: ±4 K / T_A ≥100°C: ±5 K / T_A≥150°C: ±8 K / T_A ≥200°C: ±10 K		
contact resistance			< 30 mΩ					
hysteresis / reset temperature			T_A <130°C: 25K / T_A >130°C: 25 ±15K/ T_A >200°C: 30K ±20K			---		
degree of protection of enclosure (EN 60529)			IP00 (60EN IP64)					
dielectric strength			AC 1.500 V/1min. or AC 1.800 V/1 sec.					
suitable for use in protection class			I, II					
certifications		VDE	EN 60730-1 / -2-9					
		UL	UL873 / UL60730-1A / -2-9 [4]					
		CSA	C22.2 No. 24 [3]					

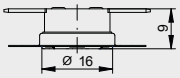
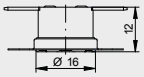
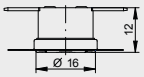
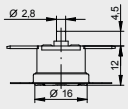
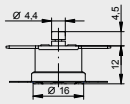
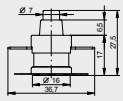
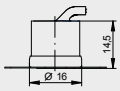
[1] no certification [2] type 55H only VDE: 7A, 250V AC, 30.000 cycles, up to 260°C [3] different ratings [4] type 15N

Caps

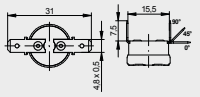
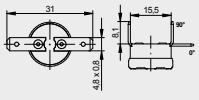
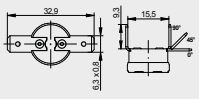
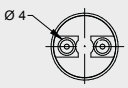
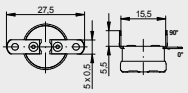
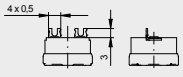
	cap code 1 in standard execution (T_A 50°C - 199°C), material aluminium
	cap code T (T_A 0°C - 50°C and T_a ≥ 200°C and all normally open types), material aluminium

Deviations from standard controls (caps, terminals, fixings) on request.
Especially for electronic applications with voltage 6...120 Vac / 6...30 Vdc and current 10...100 mA there are switches with crossbar-contacts available.
Controls as single operation device (SOD) up to 150°C and reset temperature minus 35°C are available (Typ 81ES).

Standard types

type	n.c. normally closed = 1	n.o. normally open = 3	code	illustration	drawing dimensions (mm)	technical description
R28 11EN	1	3	low mounting form, housing thermoset-ting plastic, 9 mm			terminals 6.3 x 0.8, small, loose bracket, aluminium cap
R28 03EN	1	3	housing thermoset-ting plastic, 12 mm			terminals 6.3 x 0.8, small, loose bracket, aluminium cap
R28 52N	1	3	housing ceramic, 12 mm			terminals 6.3 x 0.8, small, loose bracket, aluminium cap
R27 05EN	1	---	manual, reset pin, housing thermosetting plastic			terminals 6.3 x 0.8, small, loose bracket, aluminium cap, reset pin
R27 15N	1	---	manual, reset pin, housing ceramic			terminals 6.3 x 0.8, small, loose bracket, aluminium cap, ceramic reset pin
R29 23EN	1	---	manual, reset pin, housing thermoset-ting plastic			terminals 6.3 x 0.8, small, loose bracket aluminium cap, reset pin
R28 60EN	1	3	tight against humidity, leads, housing thermoset-ting plastic			lead wire, standard lead length 300 mm, fixed bracket, aluminium cap degree of protection IP64

Terminals

code	used in type	illustration	drawing dimensions (mm)	technical description
Ms: 05 (0°) Ms: 10 (45°) Ms: 06 (90°)	R27, R28, R29			terminals 4.8 x 0.5, brass nickel plated up to T_A max. 150°C, >150°C steel nickel plated, also available angle 45 / 90 deg.
Ms: 45 (0°) Ms: 46 (90°)	R27, R28, R29			terminals 4.8 x 0.8, brass nickel plated up to T_A max. 150°C, also available angle 90 deg.
Ms: 03 (0°) Ms: 09 (45°) Ms: 04 (90°) St: 93 (0°) St: 94 (90°)	R27, R28, R29			terminals 6.3 x 0.8, brass nickel plated up to T_A max. 150°C, >150°C steel nickel plated, also available angle 45 / 90 deg.
00	R28			solder terminals, T_A max. 140°C
41 (0°) 42 (90°)	R27, R28, R29			solder terminals, nickel plated, also available angle 90 deg. T_A max. 140°C
SA	R27, R28			PCB terminals, solder terminals, T_A max. 140°C

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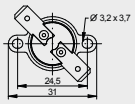
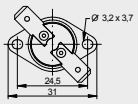
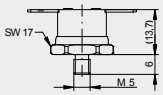
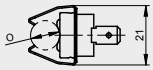
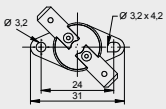
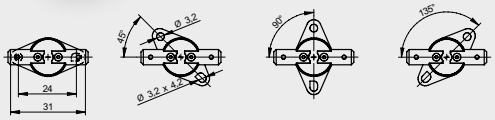
Brackets

code	used in type	illustration	drawing dimensions (mm)	technical description
4	R27, R28, R29			loose bracket, small
3	R27, R28, R29			loose bracket
S	R27, R28, R29			stud of M5 x 6 brass, SW17 (also other variations available)
M, J, E, K, L	R27, R28, R29			pipe mounting bracket, sizes: 2/8“, 3/8“, 4/8“, 5/8“, 6/8“
A+B	R27, R28, R29			fixed bracket
Variation angle degrees for fix brackets (A + B)	R27, R28, R29			Possible angles: 0 / 45 / 90 / 135 degrees

Ordering example

R28 | 03 | E | N | 1 | 5 | T | 03 | 4 | 50±3 | 40±4

- R28 — Microtherm type
- 03 — base type
- E — european version
- N — type of contact (N normal contact / P low current)
- 1 — contact execution (1 normally closed / 3 normally open)
- 5 — housing material (2 ceramic / 5 plastic)
- T — cap code
- 03 — terminal code
- 4 — fixing code
- 50±3 — response temperature
- 40±4 — reset temperature

Marking

A100	norm. closed (B norm. open) resp. temperature
03EN XXXX	type manufacture code
XXXX	date of manufacture

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MIC Microtherm International Cooperation

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temperature sensor

type

STS1

Applications

- Household appliances
- Electronics
- Engineering
- Automotive

Benefits

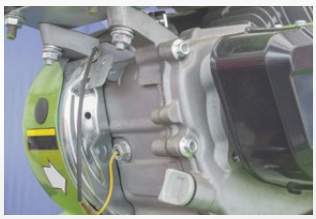
- Temperatures from -40°C up to +170°C
- Excellente long-temperature stability
- High precision and reliability
- No reversal polarity (+/-) possible

Description

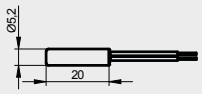
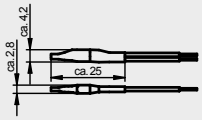
Sensors of the STS type series are characterized by a temperature curve which is very similar to KTY sensors showing a positive temperature coefficient. The STS1 is a suitable alternative to former product KTY84-130. Available standard executions are shrink-sleeve or PPS housing package, beside these there are manifold customized solutions on hand.

technical data

ratings	type
	STS1
typical resistance at 100°C (±3%)	1000 Ω
operating temperature range	-40°C ... +170 (190)°C
minimum insulation resistance (100V_{DC})	100 MΩ
operating current	1 mA
maximum rated power	10 mW

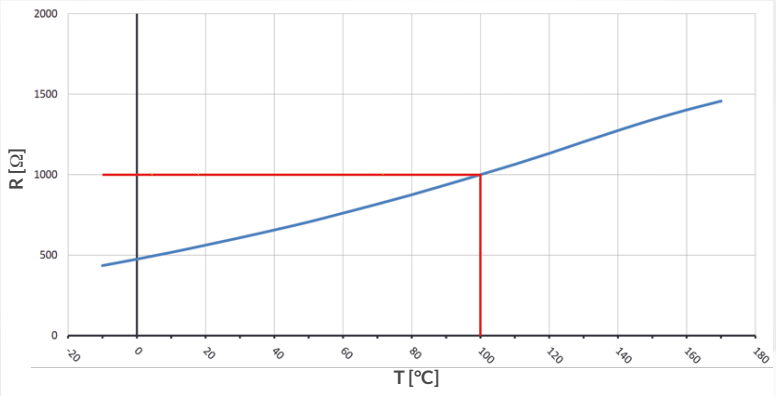



standard types

type execution	illustration	drawing dimensions (mm)	technical description
STS1 G918			housing PPS leads ETFE, AWG24, white
STS1 U129			shrink sleeve Kynar® leads ETFE, AWG24, white

temperature vs. resistance

T °C	-10	0	10	20	30	40	50	60	70	80	90	100	110	120	130	140	150	160	170
min.	414	452	493	537	582	629	678	733	788	846	907	970	1030	1094	1162	1227	1290	1346	1396
typ.	435	475	517	562	608	656	706	761	817	875	937	1000	1064	1132	1204	1274	1341	1402	1457
max.	456	498	541	587	634	683	734	789	846	904	967	1030	1098	1170	1246	1321	1392	1458	1518



ordering example

STS1 | 1000 | 3 | L360 | 500 | G918

- STS1 — Type of sensor
- 1000 — R at 100 °C
- 3 — Tolerance (%)
- L360 — Leads white, AWG24, ETFE
- 500 — Length of leads (± 10 mm)
- G918 — Housing number

Remark: Values of electric resistance correspond almost exactly to KTY84. Above 170°C the linearity can differ.

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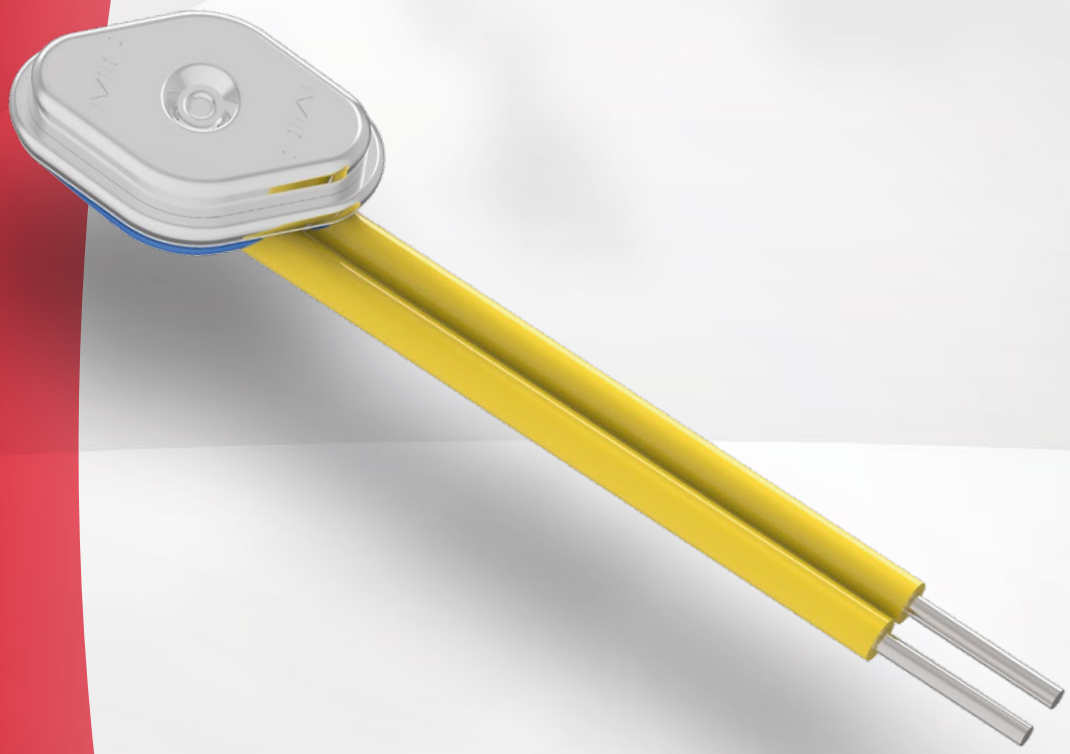
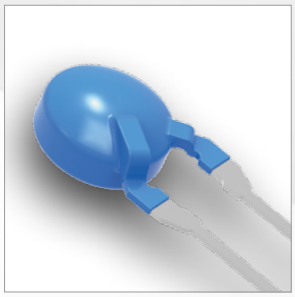
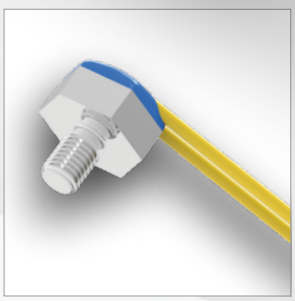
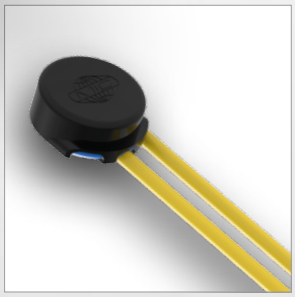
05/2017-Technical subject to change without notice

MICROTHERM

MICROTHERM

Thermal motor protector
Temperature limiter
Thermal cut-out



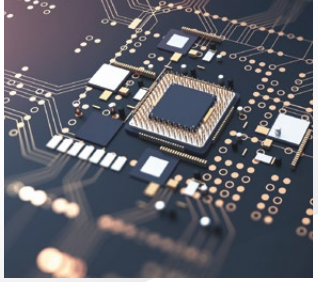
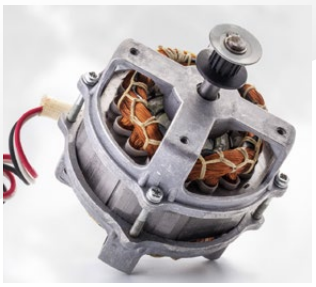
Applications

- Motors
- Transformers
- Coils
- Electronics, sensors

Benefits

- Temperature and current sensitive or
- only temperature sensitive
- Small dimensions
- High power rating
- No vibration noise

Description


Switches of the **T1 and T2 type series** are based on a **two-contact system**. A thermo-bimetal snap-disc, which is influenced by temperature, switches on or closes a circuit when the permanently set switching temperature is reached. In this case, the electr. current directly through the bimetallic discharge element, and thus allows a **combination of temperature and current sensitive monitoring**.

The temperature will thereby be applied to the inner precision switching unit from all sides. The current sensitivity of the switching element is particularly effective when the motor is blocked, and the current flow is considerably higher: the drive is **switched off very quickly** and thus damage to the device is prevented through an increased temperature.

Beside the standard counters in single implementation the protectors are also offered in **twin and triplet configuration**.

Technical data

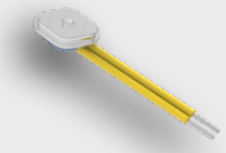
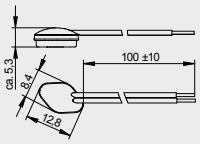
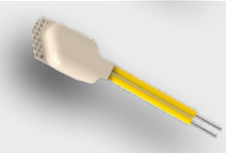
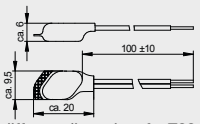
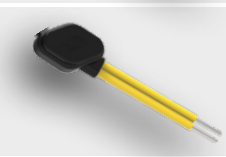
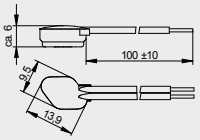
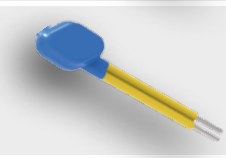
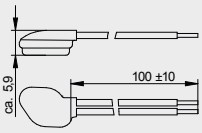
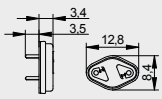
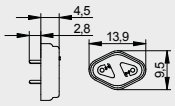
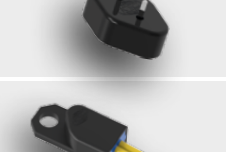
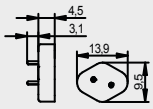
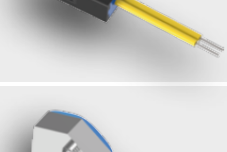
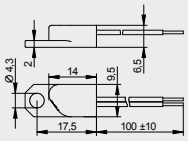
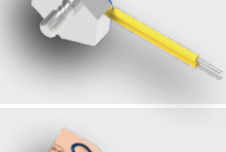
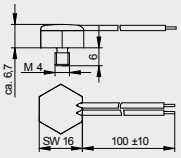
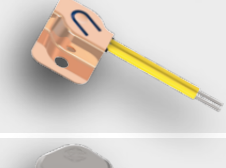
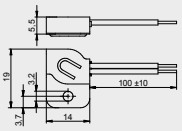
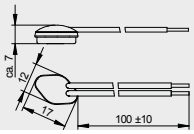
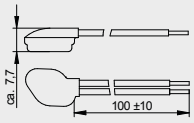
type ratings			control				
			T11 A / E	T12 A / E	T22 A	T10B / G	T22 B
version			normally closed			normally open	
rated current at 250 V 50/60 Hz (power factor 0.95 / 0.6)			2.5 A / 1,6 A	6.3 A / 2.5 A	20.0 A / 3.0 A	2.0 A / 1.6 A	3.5 A / 2.0 A
switching cycles under rated current			10,000				
max. current under failure conditions at 250 V 50/60 Hz (power factor 0.95)			10.0 A	12.0 A	30.0 A	10.0 A	20.0 A
switching cycles under max. current			300		600	300	1,000
temperature rating T_A (steps in 5 °C)			(50) 70 °C... 180 °C [1]			80 °C ... 160 °C [2]	
tolerances			Standard: ± 5 °C				
feature of automatic action			1.C.M, 2.C		2.B, 1.C, 3.C	1.B, 2.C	
contact resistance (incl. wire of 100 mm)			< 50 mΩ				
hysteresis			30 °C ± 15 °C [3] [4]				
dielectric strength (standard insulation)			2 kV				
shock / vibration testing (similar to EN 50155)			400 m/s² sine half wave / 100 m/s² 5 Hz ... 2.000 Hz sine				
resistances to impregnation			tight against ordinary resins and lacquers				
degrees of protection provided by enclosures (EN 60529)			IP00				
suitable for use in protection category			I, II				
approvals	VDE / ENEC		EN 60730-1 / -2-9				
	UL		UL 2111 / UL 873 [5]				-
	CSA / cUL		C22.2 No. 77 / C22.2 No. 24 [5]				-
	CQC		GB14536.1-1998 / GB14536.10-1996 [5]				

[1] T_A up to 50°C on request [2] approval to EN60730-2-2 up to 180°C [3] with ± 3 K tolerances and smaller hysteresis on request
[4] at the T_A (upper and lower) limits the hysteresis could deviate [5] on request

The variety of our product variations is nearly infinite. Microtherm distinguishes itself by a high expert's know-how in the area of customised developments. We will be pleased to give you specific advice during a personal consultation and present you all the options suitable for your application:

- application of plug connectors
- unique packaging and overmolding variations
- specific cable assemblies and many more

Versions

control type	n.c.	n.o.	code	illustration	drawing dimensions (mm)	technical specification	approvals
T10 T11, T12	 A	B				no insulation, potted	VDE, UL, cUL
T10 T11, T12	A	B	U250			shrink cap, potted	VDE, UL, cUL
T22	A	B	U256		different dimentions for T22		
T10 T11, T12	 A	B	U174			cap of PPS, potted	VDE, UL, cUL
T10 T11, T12	 A	B	U112			coated, T_A max. 160 °C	VDE, UL, cUL
T11, T12	A		A334			no insulation PCB connector grid dimension 5.08	VDE, UL, cUL
T11, T12	A		A334 U314			cap of PPS PCB connector grid dimension 5.08	VDE, UL, cUL
T11, T12	A		A334 U315			cap of PPS PCB connector grid dimension 5.08	VDE, UL, cUL
T10 T11, T12	 A	B	U293			housing of PPS, potted	VDE, UL, cUL
T10 T11, T12	 E	G	G502			potted aluminium housing anodized black M4x6 T_A max. 150 °C	VDE, UL, cUL
T10 T11, T12	 A	B	B199			CuBe mounting cap combined with U174 / U250 / U112	VDE, UL, cUL
T22	A	B				no insulation, potted	VDE, UL, cUL
T22	A	B	U112			coated, T_A max. 160 °C	VDE, UL, cUL

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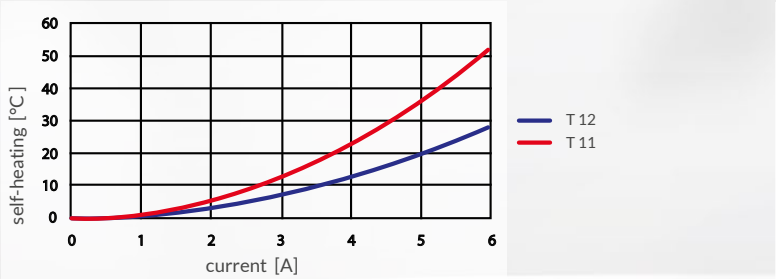
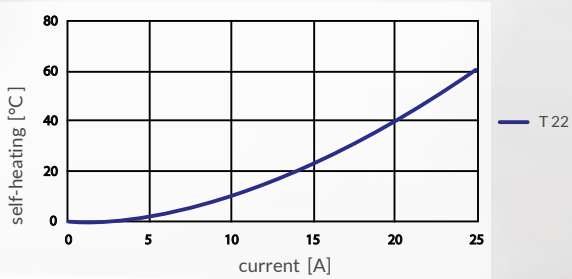
Standard wire

lead	code	temperature max.	operating voltage max.	approx. diameter-insulation	approx. cross section / diameter	UL style
stranded white	L300	150 °C	300 V	1,50 mm	AWG24 / 0,25 mm²	3398
	L310			1,82 mm	AWG20 / 0,50 mm²	
	L320 [1)]			2,10 mm	AWG18 / 1,00 mm²	
	L360	200 °C	600 V	1,20 mm	AWG24 / 0,25 mm²	10086
	L370			1,60 mm	AWG20 / 0,50 mm²	
	L380 [1)]			1,80 mm	AWG18 / 1,00 mm²	
solid yellow	L400	150 °C	300 V	1,35 mm	AWG24 / 0,50 mm	3398
	L410			1,66 mm	AWG20 / 0,80 mm	
	L430	200 °C	300 V	1,16 mm	AWG24 / 0,50 mm	1332
	L440			1,54 mm	AWG20 / 0,80 mm	

Standard length 100 ± 10 mm, stripped 6 ± 1 mm, for T10 AWG24 and for T11 / T12 AWG20 is recommended [1)] T22 only

Heating by current





The characteristic curve in the diagram is measured with a thermal switch without any insulation in an oil bath.

Note: The self-heating depends on the thermal conduction of the control to the equipment or part which should be protected.

Ordering example

T11 | A | 120 | 05 | L310 | 300 | U250

- U250 — shrink cap insulation
- 300 — length 300 mm
- L310 — lead wire white, AWG20
- 05 — tolerance
- 120 — temperature
- A — normally closed
- T11 — type

Marking

T11A	type (T11 n.c.)
12005	response temperature (120°C), tolerance (± 5°C)
056D	date of manufacture (May 2016), country (D=Germany)

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MIC Microtherm International Cooperation

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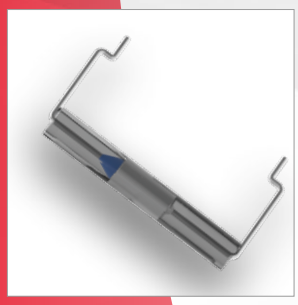
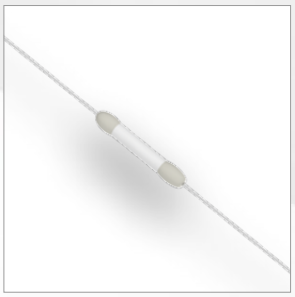
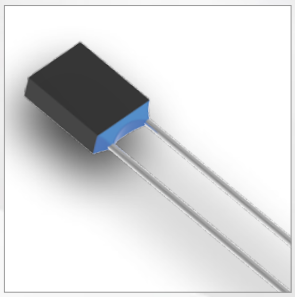
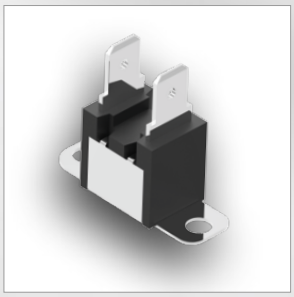
Thermal cut-out
Thermal fuse

type
- HDM
- MT
- SDF
- S3M

Applications

- Household appliances
- Electronic appliances
- Fan heaters
- Transformers
- Automotive industry

Benefits

- Small compact designs
- Broad product line
- Temperature range up to 240°C
- Custom-made executions

Description

Fuses of this type are highly universally applicable due to their small design and the **wide range of current-carrying capacity**. They are found in all industries with electro-technical applications.

The portfolio ranges from the **miniature fuse S3M7** with a Ø 3 mm and length of 10 mm, up to the **robust S3M8** with a current load capacity of up to 25 A. And the so-called high-current fuses S3M5 and S3M8 can be particularly found in heating applications of all kinds.

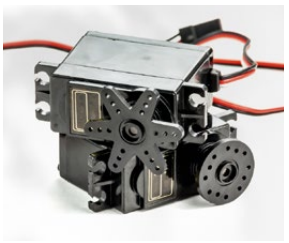
Since the purely wired fuse body usually has to be further processed for the respective application (insulation of the body, integration of connecting leads and connectors), Microtherm also offers the **possibility of customer-specific designs** for these fuses.

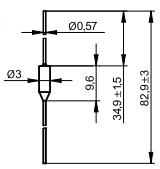
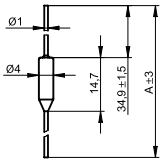
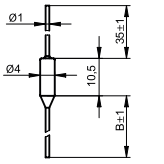
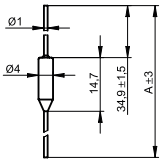
Beside these Microtherm offers the **MT series** in axial and radial shape as a cost-effective solution for a wide range of applications. These thermal fuses are based on melting wire design whereas technical data is given in the tables on the right page.

The portfolio of thermal fuses is fulfilled by the **HDM series** which is a robust surface mounting device.



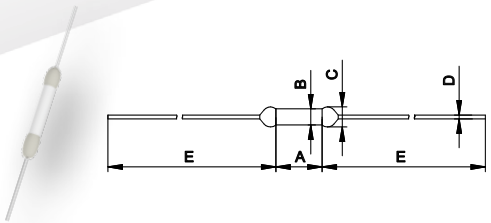


	S3M7 5A	S3M4 10A	SDFS/SDFL 15A	S3M5 20A	S3M8 25A
					
	metal housing	size A (00): 63,8 size A (01): 82,9	size B (S): 25,4 size B (L): 35	size A (00): 63,8 size A (01): 82,9	size A (00): 63,8 size A (01): 82,9

T_f (tolerance +0 / -10°C)	type	T_h	T_m	type	T_h	T_m	type	T_h	T_m(VDE)	T_m(UL)	type	T_h	T_m	type	T_h	T_m
66	-	-	-	-	-	-	DF	42	110	130	-	-	-	-	-	-
70	E7F	55	125	E4A	55	130	-	-	-	-	E5A	55	175	E8A	45	175
72	-	-	-	E4A	57	100	DF	50	115	110	E5A	57	175	E8A	47	175
77	E7F	62	125	E4A	62	125	DF	55	120	110	E5A	62	200	E8A	52	200
84	E7F	69	125	E4A	69	125	DF	60	125	114	E5A	69	200	E8A	59	200
91	-	-	-	-	-	-	DF	57	135	121	-	-	-	-	-	-
93	E7F	78	140	E4A	78	140	-	-	-	-	E5A	78	215	E8A	68	215
98	E7F	83	140	E4A	83	140	DF	76	140	130	E5A	83	215	E8A	73	215
100	E7F	85	130	E4A	85	140	DF	78	135	250	E5A	85	215	-	-	-
104	-	-	-	E4A	89	150	DF	80	150	150	E5A	89	225	E8A	79	225
110	E7F	95	140	E4A	95	150	DF	88	140	140	E5A	95	225	E8A	85	225
117	E7F	102	150	E4A	102	160	-	-	-	-	E5A	102	235	E8A	92	235
119	-	-	-	-	-	-	DF	95	170	170	-	-	-	-	-	-
121	E7F	106	150	E4A	106	160	-	-	-	-	E5A	106	235	E8A	96	235
128	E7F	113	150	E4A	113	205	DF	106	155	155	E5A	113	235	E8A	103	235
141	-	-	-	-	-	-	DF	117	171	171	-	-	-	-	-	-
144	E7F	129	175	E4A	129	240	DF	120	250	250	E5A	129	250	E8A	119	250
152	E7F	137	175	E4A	137	205	DF	128	176	175	E5A	137	250	E8A	127	250
167	E7F	152	200	E4A	154	240	-	-	-	-	E5A	152	285	E8A	142	285
170	-	-	-	-	-	-	DF	146	300	190	-	-	-	-	-	-
172	E7F	157	200	E4A	157	240	-	-	-	-	E5A	157	350	-	-	-
184	E7F	169	200	E4A	169	210	DF	160	300	214	E5A	169	350	E8A	159	350
190	E7F	175	270	E4A	175	310	-	-	-	-	E5A	175	350	-	-	-
192	-	-	-	E4A	177	210	DF	164	290	222	E5A	177	350	E8A	167	350
205	-	-	-	E4A	189	310	-	-	-	-	E5A	189	375	-	-	-
216	-	-	-	E4A	200	375	DF[1)]	191	241	-	E5A	200	375	-	-	-
228	-	-	-	-	-	-	DF	193	300	300	-	-	-	-	-	-
229	-	-	-	E4A	200	375	-	-	-	-	E5A	200	375	E8A	200	375
240	-	-	-	E4A	200	450	DF	200	290	260	E5A	200	375	E8A	200	375

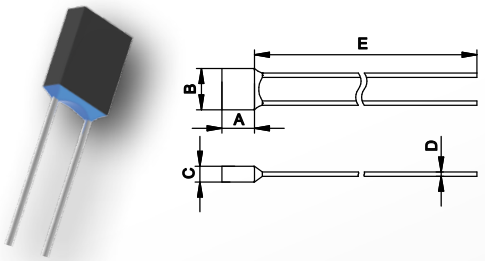
[1)] VDE approved only Tape + Reel, cut and bent on request



type	A	B	C	D	E	approvals
MTVS	6,5±0,5	Ø2,1±0,1	2,6 max	Ø0,5±0,05	37±3	UL, cUL, TÜV, CCC
MTKF	6,0±1	Ø1,5±0,1	1,8 max	Ø0,53±0,1	'00' = 38±3; '01' = 68±3	UL, VDE
MTHS	9,0±0,5	Ø2,5±0,5	3,0 max	Ø0,54±0,05	36±3	UL, cUL, TÜV, CCC
MTTF	6,3±1	Ø2,0±0,1	2,3 max	Ø0,53±0,1	'00' = 38±3; '01' = 68±3	UL, VDE
MTCS	11,5±0,5	Ø3,3±0,5	3,8 max	Ø0,80±0,05	35±3	UL, cUL, TÜV, CCC
MTYF	10,0±1	Ø3,0±0,2	3,3 max	Ø0,70±0,1	'00' = 38±3; '01' = 68±3	UL, VDE

T_f (tolerance +0 / -10°C)	type 1A	T_h	T_m	type 2A	T_h	T_m	type 5A	T_h	T_m
76	MTVS - V0[1]	53	200	MTTF - T0F[2]	55	200	MTCS - C0[1]	53	200
86	MTKF - K1F	60	200	MTTF - T1F[2]	60	200	MTCS - C18	61	200
102	MTKF - K2F	80	200	MTTF - T2F	75	200	MTYF - Y2F	70	200
115	MTKF - K3F	99	200	MTTF - T3F	95	200	MTYF - Y3F	90	200
127	MTKF - K4F	110	200	MTTF - T4F	110	200	MTYF - Y4F	100	200
133	MTKF - K13F	110	200	MTHS - H8	111	200	MTCS - C8	108	200
136	MTKF - K5F	115	200	MTHS - H9	112	200	MTCS - C9	111	200
139	MTVS - V13	115	200	MTHS - H13	115	200	MTCS - C13	112	200
145	MTVS - V6	121	200	MTTF - T7F	125	200	MTCS - C6	118	200
150	MTVS - V7	126	200	MTHS - H7	126	200	MTCS - C7	123	200

[1] only TÜV, CCC [2] only 1A



type	A	B	C	D	E	approvals
MTNF	4,1±0,5	5,2±0,5	2,0±0,3	0,53±0,1	'S' = 36±3; 'L' = 68±3	UL, VDE
MTF	4,1±0,5	5,2±0,5	2,3±0,2	0,50±0,05	56±3	UL, VDE, CCC
MTX	5,8±0,5	5,8±0,5	2,3±0,2	0,54±0,05	64±3	UL, VDE, CCC
MTY	7,0±0,5	6,6±0,5	2,7±0,3	0,80±0,05	63±3	UL, VDE, CCC
MTT	7,5±0,5	8,3±0,5	3,4±0,2	1,05±0,5	38±5	UL, VDE, CCC
MTP	11,5±0,5	10,8±0,5	4,8±0,2	1,60±0,05	39±5	UL, VDE, CCC

T_f (tolerance +0 / -10°C)	type 1A	T_h	T_m	type 3A	T_h	T_m	type 5A	T_h	T_m	type 15A	T_h	T_m	type 20A	T_h	T_m
76	MTF - F0[1]	53	200	MTX - X0[1]	53	200	MTY - Y0[1]	53	200	-	-	-	-	-	-
86	MTNF - N1F	60	200	MTX - X18	61	200	MTY - Y18[1]	61	200	-	-	-	-	-	-
102	MTNF - N2F	75	200	MTX - X1	79	200	MTY - Y1[1]	77	200	MTT - T102	72	200	-	-	-
115	MTF - F2	91	200	MTX - X2	91	200	MTY - Y2	89	200	MTT - T115	85	200	MTP - P115	82	200
125	MTF - F3	100	200	MTX - X3[3]	100	200	-	-	-	-	-	-	-	-	-
130	MTF - F4	106	200	MTX - X4	106	200	MTY - Y4	103	200	-	-	-	-	-	-
133	MTF - F8	111	200	MTX - X8	111	200	-	-	-	-	-	-	-	-	-
136	MTNF - N5F	100	200	MTX - X9	112	200	MTY - Y9	111	200	MTT - T136	106	200	MTP - P136	102	200
145	MTF - F6[1]	121	200	MTX - X6	121	200	-	-	-	-	-	-	-	-	-
150	MTF - F7	126	200	MTX - X7	126	200	MTY - Y7	123	200	-	-	-	-	-	-
160	MTF - F16[2]	135	200	MTX - X16[2]	135	200	-	-	-	-	-	-	-	-	-

[1] not VDE [2] only CCC

T_f	**Rated Functioning Temperature:** The maximum temperature at which the thermal cutoff changes its state of conductivity to open circuit with sensing current as the only load. The rated functioning temperature is measured during a temperature rise of approximately 0.5°C per minute.
T_h	**Holding Temperature:** Maximum temperature of the TCO measured at the case end of the thermal cutoff at which the thermal cutoff can be maintained for a period of 168 hours without opening. General note: It is advised that TCOs are not exposed to continuous operating temperatures in excess of lower than Tf -25°C.
T_m	**Maximum Overshoot Temperature:** The maximum temperature at which the thermal cutoff, having changed its state of conductivity, can be maintained at twice rated voltage for a specified period of time, during which its mechanical and electrical properties will not be affected.

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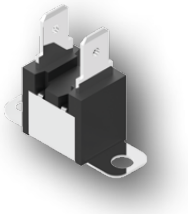
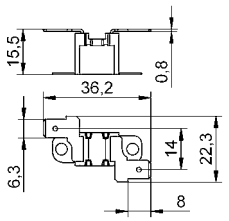
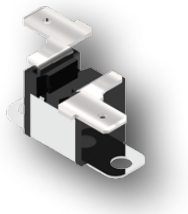
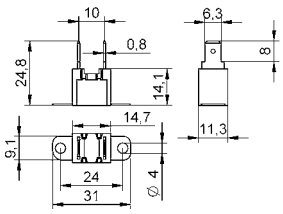
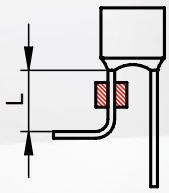
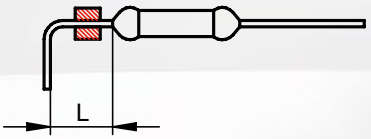
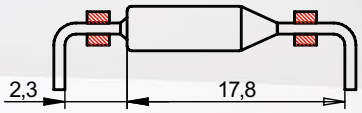
	HDMV, HDMH 15A	T_f (Tolerance +0 / -10°C)	type	T_h	T_m	approvals
	HDMV 	78	DM	62	250	UL, cUL
		90	DM	68	250	UL, cUL
		99	DM	83	250	UL, cUL
		110	DM	86	250	UL, cUL
		120	DM	96	250	UL, cUL, VDE
	HDMH 	130	DM	112	250	UL, cUL
		140	DM	125	250	UL, cUL
		150	DM	135	250	UL, cUL, VDE
		170	DM	145	250	UL, cUL
		182	DM	163	250	UL, cUL
		190	DM	170	250	UL, cUL

Notes for handling of parts

Bending leads

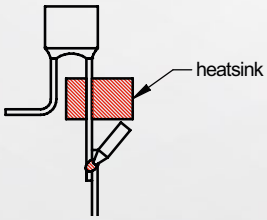


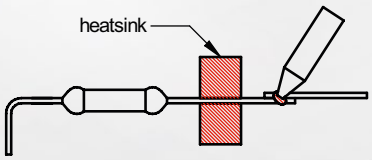


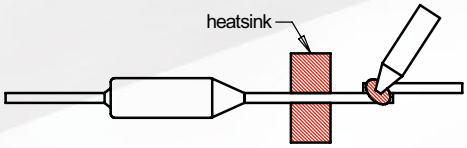


for wire up to ø 1mm	L >= 3mm
for wire > ø 1mm	L >= 5mm
Bending radius in general	R >= 1mm

Soldering leads







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